

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT			1. CONTRACT ID CODE N/A		PAGE OF PAGES 1 93		
2. AMENDMENT/MODIFICATION NO. 0003		3. EFFECTIVE DATE AUG 07, 2001		4. REQUISITION/PURCHASE REQ. NO. N/A		5. PROJECT NO. (If applicable) SPEC. NO. 1139	
6. ISSUED BY CODE		7. ADMINISTERED BY (If other than Item 6) CODE		DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, SACRAMENTO 1325 J STREET SACRAMENTO, CALIFORNIA 95814-2922 ATTN: CONTRACTING DIVISION			
DEPARTMENT OF THE ARMY U.S. ARMY ENGINEER DISTRICT, SACRAMENTO DEPARTMENT OF THE ARMY U.S. ARMY ENGINEER DISTRICT, SACRAMENTO SACRAMENTO, CALIFORNIA 95814-2922SACRAMENTO,							
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)				(√)	9A. AMENDMENT OF SOLICITATION NO. DACA05-01-B-0002		
				×	9B. DATED (SEE ITEM 11) N/A		
					10A. MODIFICATION OF CONTRACTS/ORDER NO. N/A		
					10B. DATED (SEE ITEM 13) N/A		
CODE		FACILITY CODE					

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☒ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

N/A

NOTE: ITEM 13 BELOW IS N/A.

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(√)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A. N/A
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority) N/A

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

AIR TRAFFIC CONTROL TOWER

BEALE AFB, CALIFORNIA

NOTE: Delete Section 02052 in its entirety.

2 Encl.

1. Revised Pages: Section 01312 Section 01505, 02512-6, Section 16710, Section 16711, Section 16768

2. Revised Drawings: E1.33, E1.35, E6.01, E6.02, E6.04, E6.22, E6.23, E6.71

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)		16B. UNITED STATES OF AMERICA	
		BY (Signature of Contracting Officer)	
15C. DATE SIGNED		16C. DATE SIGNED	

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01312

RESIDENT MANAGEMENT SYSTEM (RMS)

- 1.1 GENERAL
 - 1.1.1 Correspondence and Electronic Communications
- 1.2 Other Factors
- 1.2 RMS-QC SOFTWARE
- 1.3 SYSTEM REQUIREMENTS
- 1.4 RELATED INFORMATION
 - 1.4.1 RMS-QC User Guide
 - 1.4.2 Contractor Quality Control (CQC) Training
- 4.3 Video Training for RMS-QC
- 1.5 CONTRACT DATABASE
- 1.6 DATABASE MAINTENANCE
 - 1.6.1 Administration
 - 1.6.1.1 Contractor Information
 - 1.6.1.2 Subcontractor Information
 - 1.6.1.3 Correspondence
 - 1.6.1.4 Requests for Information
 - 1.6.1.5 Equipment
 - 1.6.1.6 EM 385-1-1, Corps of Engineers Safety Manual and RMS Linkage
 - 1.6.1.7 Management Reporting
 - 1.6.2 Finances
 - 1.6.2.1 Pay Activity Data
 - 1.6.2.2 Payment Requests
 - 1.6.3 Quality Control (QC)
 - 1.6.3.1 Daily Contractor Quality Control (CQC) Reports.
 - 1.6.3.2 Deficiency Tracking.
 - 1.6.3.3 Three-Phase Control Meetings
 - 1.6.3.4 Accident/Safety Tracking.
 - 1.6.3.5 Features of Work
 - 1.6.3.6 QC Requirements
 - 1.6.4 Submittal Mngement
 - 1.6.5 Schedule
 - 1.6.6 Import/Export of Data
- 1.7 IMPLEMENTATION
- 1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM
 - 1.8.1 File Medium
 - 1.8.2 Disk or CD-ROM Labels
 - 1.8.3 File Names
- 1.9 MONTHLY COORDINATION MEETING
- 1.10 NOTIFICATION OF NONCOMPLIANCE

-- End of Section Table of Contents --

SECTION 01312

RESIDENT MANAGEMENT SYSTEM (RMS)

1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS-W) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS-Windows, referred to as RMS-QC (QC for Quality Control), to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS-W and RMS-QC will facilitate electronic exchange of information and overall management of the contract. RMS-QC provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data

1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, "Project Schedule", Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS-QC. Also, there is no separate payment for establishing and maintaining the RMS-QC database; all costs associated therewith shall be included in the contract pricing for the work.

1.2 RMS-QC SOFTWARE

RMS-QC is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the RMS-QC software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the RMS-QC software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide RMS-QC on high-density diskettes or CD-ROM. Any program updates of RMS-QC will be made available to the Contractor via the Government RMS Website as they become available.

1.3 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run RMS-QC:

Hardware

IBM-compatible PC with 200 MHz Pentium or higher processor

32+ MB RAM

4 GB hard drive disk space for sole use by the RMS-QC system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 28 BPS

Software

Microsoft (MS) Access 97 or newer version database software

MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

Word Processing software compatible with MS Word 97 or newer

Internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

Electronic mail (E-mail) compatible with MS Outlook

1.4 RELATED INFORMATION

1.4.1 RMS-QC User Guide

After contract award, the Contractor shall download instructions for the installation and use of RMS-QC from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.4.2 Contractor Quality Control(CQC) Training

The use of RMS-QC will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

4.3 Video Training for RMS-QC

After contract award, the Contractor will be provided with a CD containing a training video on the use of RMS-QC.

1.5 CONTRACT DATABASE

Prior to the pre-construction conference, the Government shall provide the Contractor with basic contract award data to use for RMS-QC. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.6 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the RMS-QC database throughout the duration of the contract. The Contractor shall establish and maintain the RMS-QC database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The RMS-QC database typically shall include current data on the following items:

1.6.1 Administration

1.6.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

1.6.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in RMS-QC. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

1.6.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.6.1.4 Requests for Information

RMS-QC includes a means for the Contractor to enter, log, and transmit requests for information (RFI) to the Government. RFIs can be exchanged electronically using the import/export functions of RMS-QC. The Contractor shall also provide the Government with a signed, printed copy of each RFI.

All RFIs from the Contractor to the Government shall have the prefix "RFI" and shall be numbered sequentially beginning with RFI-0001.

1.6.1.5 Equipment

The Contractor's RMS-QC database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.6.1.6 EM 385-1-1, Corps of Engineers Safety Manual and RMS Linkage

Upon request, the Contractor can obtain a copy of the current version of the Safety Manual, EM 385-1-1, on CD. Data on the CD will be accessible through RMS-QC, or in stand-alone mode.

1.6.1.7 Management Reporting

RMS-QC includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of RMS-QC. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.6.2 Finances

1.6.2.1 Pay Activity Data

The RMS-QC database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.6.2.2 Payment Requests

All progress payment requests shall be prepared using RMS-QC. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using RMS-QC. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.6.3 Quality Control (QC)

RMS-QC provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the RMS-QC generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the

accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.6.3.1 Daily Contractor Quality Control (CQC) Reports.

RMS-QC includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by RMS-QC shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the RMS-QC-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.6.3.2 Deficiency Tracking.

The Contractor shall use RMS-QC to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC Comments. The contractor shall maintain a current log of its QC comments in the RMS-QC database. The Government will log the deficiencies it has identified using its QA comments. The Government's QA comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA comments.

1.6.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS-QC.

1.6.3.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize RMS-QC to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

1.6.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the RMS-QC database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.6.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in RMS-QC. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via RMS-QC.

1.6.4 Submittal Mnagement

The Government will provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns as described in Section 01330, SUBMITTAL PROCEDURES. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use RMS-QC to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using RMS-QC. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.6.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", or Section 01320, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the RMS-QC database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.6.6 Import/Export of Data

RMS-QC includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

1.7 IMPLEMENTATION

Contractor use of RMS-QC as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its RMS-QC database, and to provide the Government with regular database updates. RMS-QC shall be an integral part of the Contractor's management of quality control.

1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the RMS-QC built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

1.8.1 File Medium

The Contractor shall submit required data on 3-1/2" double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.8.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01505

GENERAL REQUIREMENTS

PART 1 GENERAL

- 1.1 SCRAP MATERIAL
- 1.2 WRITTEN GUARANTEES AND GUARANTOR'S LOCAL REPRESENTATIVE
- 1.3 PRICING OF CONTRACTOR-FURNISHED PROPERTY
- 1.4 TEMPORARY ELECTRIC WIRING
 - 1.4.1 Temporary Power and Lighting
 - 1.4.2 Construction Equipment
 - 1.4.3 Circuit Protection
- 1.5 UTILITIES
- 1.6 GENERAL SAFETY REQUIREMENTS
 - 1.6.1 General
 - 1.6.2 The Prime Contractor's Superintendent
 - 1.6.3 Job Hazard Analysis
 - 1.6.3.1 Explosive Ordnance
 - 1.6.4 Violations
 - 1.6.5 Elevated Work Areas
 - 1.6.5.1 Protection
 - 1.6.5.2 Guard Rails
 - 1.6.6 Fire Prevention
 - 1.6.6.1 Inspections
 - 1.6.7 Recordkeeping/Reporting Requirements
 - 1.6.8 Accident Reporting
 - 1.6.9 Lead Based Paint
 - 1.6.10 Lockout/Tag Out
 - 1.6.11 Nuclear Sources
 - 1.6.12 Personal Protective Equipment
 - 1.6.13 Hazard Communication
 - 1.6.14 Material Handling
 - 1.6.15 Airfield Traffic Control
 - 1.6.16 Contaminated Soil
 - 1.6.17 Excavations
- 1.7 PLANNED UTILITY OUTAGES AND STREET CLOSURES
- 1.8 EXCAVATION PERMITS
- 1.9 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER
- 1.10 EQUIPMENT DATA FORM
- 1.11 HAUL ROUTE PLAN
- 1.12 AIRFIELD FOREIGN OBJECT DAMAGE (FOD)
- 1.13 CONTRACTOR SAFETY PERSONNEL REQUIREMENTS (1985 JAN HQ USACE)
- 1.14 MONTHLY SAFETY INSPECTION
- 1.15 AREAS OF RADAR RADIATION HAZARD
- 1.16 HAZARDOUS NOISE AREA
- 1.17 COLOR SCHEME FOR CONTRACTOR FACILITIES
- 1.18 WARRANTY OF CONSTRUCTION
- 1.19 FINAL EXAMINATION AND ACCEPTANCE
- 1.20 Special Construction Procedures

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section Table of Contents --

SECTION 01505

GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SCRAP MATERIAL

Materials specified to be removed and become the property of the Contractor are designated as scrap, and the Contractor, by signing this contract, hereby acknowledges that he has made due allowance for value, if any, of such scrap in the contract price.

1.2 WRITTEN GUARANTEES AND GUARANTOR'S LOCAL REPRESENTATIVE

Prior to completion of the contract, the Contractor shall obtain and furnish to the Contracting Officer's representative written guarantees for all the equipment and/or appliances furnished under the contract. The Contractor shall furnish with each guarantee: The name, address, and telephone number of the guarantor's representative nearest to the location where the equipment and/or appliances are installed, who, upon request of the Using Service's representative, will honor the guarantee during the guaranty period and will provide the services prescribed by the terms of the guarantee.

1.3 PRICING OF CONTRACTOR-FURNISHED PROPERTY

At the request of the Contracting Officer, the Contractor shall promptly furnish and shall cause any subcontractors to furnish, in like manner, unit prices and descriptive data required by the Government for property record purposes of fixtures and equipment furnished and installed by the Contractor.

1.4 TEMPORARY ELECTRIC WIRING

1.4.1 Temporary Power and Lighting

The Contractor shall provide construction power facilities in accordance with the safety requirements of the National Electrical Code NFPA No. 70 and the SAFETY AND HEALTH REQUIREMENTS MANUAL EM 385-1-1. The Contractor, or his delegated subcontractor, shall enforce all the safety requirements of electrical extensions for the work of all subcontractors. All work shall be accomplished by skilled electrical tradesmen in a workmanlike manner, as approved by the Contracting Officer.

1.4.2 Construction Equipment

In addition to the requirements of EM 385-1-1, SAFETY AND HEALTH REQUIREMENTS MANUAL, all temporary wiring conductors installed for operation of construction tools and equipment shall be either Type TW or THW contained in metal raceways, or may be multiconductor cord. Temporary wiring shall be secured above the ground or floor in a workmanlike manner and shall not present an obstacle to persons or equipment. Open wiring may only be used outside of buildings, and then only in strict accordance with

the provisions of the National Electrical Code.

1.4.3 Circuit Protection

In addition to the present requirements in EM 385-1-1 and the National Electrical Code, all 15 and 20-ampere receptacle outlets used for obtaining power during construction shall have ground fault circuit interrupters (GFCI) for personnel protection. Block and brick saws shall also be equipped with GFCI. The Contracting Officer may allow an exception to this requirement for circuits for concrete vibrators or circuits operating at other than 60 Hertz normal (in both cases an assured grounding program as described in the National Electrical Code, except utilizing the daily inspection frequency of the grounding means of such equipment, may be permitted). The assured grounding program will not be permitted as a substitute for usage of GFCI'S except as described above. All generator-powered 15- and 20-ampere, 60 Hertz receptacle outlets shall have GFCI'S, and shall be properly grounded. A testing means shall be provided which will impose a measured fault of 5 milliamperes, plus or minus 1 milliamperes, and result in tripping the GFCI unit.

1.5 UTILITIES

If the Contractor encounters, within the construction limits of the entire project, utilities not shown on the plans and not visible as to the date of this contract and such utilities will interfere with construction operations, he shall immediately notify the Contracting Officer in writing to enable a determination by the Contracting Officer as to the necessity for removal or relocation. If such utilities are removed or relocated as directed by the Contracting Officer, the Contractor shall be entitled to equitable adjustment for any additional pertinent work or delay.

1.6 GENERAL SAFETY REQUIREMENTS

1.6.1 General

The Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, (see Contract Clauses, Section 00700, ACCIDENT PREVENTION) and the Occupational Safety and Health Act (OSHA) Standards for Construction (Title 29, Code of Federal Regulations Part 1926 as revised from time to time); General Industry Standards (Title 29, Code of Federal Regulations Part 1910 as revised from time to time); and the National Fire Protection Association Codes are applicable to this contract. In case of conflict the most stringent requirement of the standards is applicable.

1.6.2 The Prime Contractor's Superintendent

The Prime Contractor's superintendent shall take an active role in enforcing the safety requirements by participation in safety conferences, hazard analysis (see below), tool box meetings, walk-through inspections, correction of violations, etc., and including that of the subcontractor's work.

1.6.3 Job Hazard Analysis

Based on the construction schedule, the Contractor shall submit a job hazard analysis of each major phase of work prior to entering that phase of activity. The analysis shall include major or high risk hazards, as well

as commonly recurring deficiencies that might possibly be encountered for that operation, and shall identify proposed methods and techniques of accomplishing each phase in a safe manner. The Prime Contractor's superintendent shall take active participation in the Job Hazard Analysis, including the subcontractors' work. Prior to start of actual work a meeting shall be held with Prime Contractor, Government, and affected subcontractor to review the Job Hazard Analysis. In addition, job site meetings shall be held to indoctrinate foreman and workers on details of this analysis.

1.6.3.1 Explosive Ordnance

1.6.4 Violations

If recurring violations and/or gross violation indicate that the safety performance is unsatisfactory, corrective action shall be taken as directed, and at the discretion of the Contracting Officer the retention or some part thereof will be withheld from the progress payment until corrective action has been completed.

1.6.5 Elevated Work Areas

Workers in elevated work areas in excess of 6 feet above an adjoining surface require special safety attention. In addition to the provisions of EM 385-1-1, the following safety measures are required to be submitted to the Contracting Officer's Representative. Prior to commencement of work in elevated work areas, the Contractor shall submit drawings depicting all provisions of his positive protection system including, but not limited to, all details of guard rails.

1.6.5.1 Protection

Positive protection for workmen engaged in the installation of structural steel and steel joists shall be provided by safety nets, tie-off's, hydraulic man lifts, scaffolds, or other required means. Decking crews must be tied-off or work over nets or platforms not over 6 feet below the work area. Walking on beams and/or girders and the climbing of columns is prohibited without positive protection.

1.6.5.2 Guard Rails

Perimeter guard rails shall be installed at floor, roof, or wall openings more than 6 feet above an adjoining surface and on roof perimeters. Rails shall be designed to protect all phases of elevated work including, but not limited to, roofing operations and installation of gutters and flashing. Rails around roofs may not be removed until all work on the roof is complete and all traffic on or across the roof ceases. Rails shall be designed by a licensed engineer to provide adequate stability under any anticipated impact loading. As a minimum, the rails shall consist of a top rail at a height of 42 inches, a mid rail and a toe board. Use of tie-offs, hydraulic man lifts, scaffolds, or other means of roof edge protection methods may be utilized on small structures such as family housing, prefabricated metal buildings, etc.

1.6.6 Fire Prevention

Twenty-four hours notice shall be given to the Contracting Officer for coordination with the Facility Fire Department prior to conducting any fire

hazardous operation. Cutting or welding will be permitted only in areas that are or have been made fire safe. Where possible, all combustibles shall be located at least 35 feet horizontally from the work site. Where such location is impracticable, combustibles shall be protected with fire blankets and/or protective welding screens to prevent slag from running out of the work area. Edges of covers at the floor shall be tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect a large pile. The Contractor shall not allow any welding/cutting or open flame operations in facilities that are protected by a wet pipe fire sprinkler or an automatic detection system, if the system is out of service. First priority of work will be to return the suppression/detection system to operational condition. Return the fire detection and/or suppression system back to an operational status (if possible) during periods that the facility is unoccupied, and at the end of the work day. The Contractor shall post a fire guard for a 24 hour period (or certify to the Fire Department that the facility is safe) after welding, cutting, and open flame operations in a facility when: (a) fire detection and suppression system can not be returned to service; (b) fire detection or suppression systems do not exist. Other fire prevention precautions shall be in accordance with the latest National Fire Codes.

1.6.6.1 Inspections

All construction sites are subject to fire and safety inspections without notice. Any violation of fire and safety standards may result in a work stoppage at the expense of the Contractor.

1.6.7 Recordkeeping/Reporting Requirements

On all contract operations, the Prime Contractor shall be responsible for recording and reporting all accident exposure and experience incident work.

(This includes exposure and experience of the prime contractor and his/her sub-contractor(s)). As a minimum these records shall include exposure work-hours and a log of occupational injuries and illnesses. (OSHA Form 200 or state equivalent as prescribed by 29 CFR 1904.5) Reference EM 385-1-1, 01.D.04.

1.6.8 Accident Reporting

In addition to the requirements for reporting accidents in accordance with EM 385-1-1, Section 1, the Prime Contractor will submit at the 50% point and 100% of project completion, a written summary of worker's compensation claims filed by workers on the project. The report will include all subcontractors. The main report covering the Prime Contractor claims will be certified as "correct and true" by the Contractor's compensation insurance carrier. The same certification will be required for subcontractor reports.

1.6.9 **Lead Based Paint**

The building this section is referencing is the Control Tower at Beale AFB, Marysville CA. The building is believed to have been built prior to 1976 and is believed to contain lead based paint. All painted surfaces are intact and will not require scraping prior to demolition. The Contractor shall protect the worker, the environment, and the surrounding community from the potential hazards associated with lead-based paint. The competent person shall have completed a minimum of 48 hours of training in inspection, management, and abatement of lead-based paint. The Contractor shall provide all employees

training necessary to comply with the requirements of 29 CFR 1926.62. The Contractor shall assure that all employees with the potential to be exposed to dust containing lead are informed of the following: the specific nature of the operations which could result in exposure to lead; the engineering controls and work practices associated with the employees' job assignments; and the contents of any work plan in effect. A record of this training shall be available at the job site for COR review. The Contractor shall assure that all potentially contaminated protective clothing is removed at the completion of a work shift and left on site. Personnel shall be prohibited from wearing potentially contaminated clothing off the site. The removal of dust from clothing or equipment by blowing, shaking, or any other means shall be prohibited.

The Contractor shall furnish facilities which provide tepid water for hand and face washing. Employees shall be required to wash the hands and face before eating, drinking, smoking, chewing gum or tobacco, taking medications, or touching the hands to the face or mouth.

The Contractor shall strip all surfaces covered with toxic preservatives, including coatings which generate toxic substances upon heating for a distance of at least four inches (4") from the area of heat application before welding, cutting or brazing on such surfaces.

1.6.10 Lockout/Tag Out

Lockout and tag out procedures will be implemented, as required by 29 CFR 1910 Section .147, during maintenance of powered tools or equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury.

1.6.11 Nuclear Sources

NRC licensing is required when equipment with nuclear sources are brought onto Beale AFB. Equipment with nuclear sources will have up-to-date source licensing and shall be stored in a secured location. Operators shall have documented instrument-specific training.

1.6.12 Personal Protective Equipment

a. **Respiratory Protection:** Respiratory protective equipment shall be NIOSH approved and respirator use shall conform to American National Standards Institute (ANSI) Z88.2, NIOSH 42 CFR Part 84 and OSHA 29 CFR 1910.134 requirements. SPK personnel performing on-site activities and using an air purifying respirator will have successfully passed a quantitative respirator fit test in accordance with OSHA 29 CFR 1910.134 within the last 12 months. Fit testing and any training related to respiratory protection for personnel will be documented.

b. **Head Protection:** All personnel will be required to wear a hard hat while working within the restricted work area. The hat will be worn properly and not altered in any way that would lessen the degree of protection offered. All hard hats will meet ANSI Standard Z89.1.

c. **Foot Protection:** Steel-tip safety work shoes/boots will be worn by on-site personnel. To afford maximum protection, safety boots will meet ANSI Standard Z41.1/75.

d. **Eye Protection:** Eye protection will be whenever there is a possibility of injury to the eye. Safety glasses are the minimum required eye protection. All safety eye protection must meet ANSI Standard Z87.1.

e. **Hand Protection:** Appropriate hand protection is necessary when

exposed to hazards such as chemical hazards from absorption of harmful substances or physical hazards such as severe cuts or lacerations, severe abrasion, or punctures.

f. **Hearing Protection:** On-site personnel may have exposures to occupational noise exceeding the action level of 8-hour TWA of 85 dBA, particularly during operations with heavy equipment. Hearing protection will be worn whenever regular conversation becomes difficult at a distance of three feet in any work area which is indicative of noise levels exceeding 85 dBA. Hearing protection shall be worn whenever aircraft activities are being conducted near the site.

1.6.13 Hazard Communication

Personnel performing field activities will receive basic hazard communication training which involves a review of the written hazard communication program, MSDSs, container labeling, and chemical health hazards.

1.6.14 Material Handling

Care should be taken when lifting and handling heavy or bulky items because they are the cause of many back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

a. The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weights over 60 pounds. Multiple employees or the use of mechanical lifting devices are required for objects over the 60-pound limit.

b. The anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.

c. The feet shall be placed far enough apart for good balance and stability (typically shoulder width). **THE FOOTING SHALL BE SOLID.**

d. The worker shall get as close to the load as possible. The legs shall be bent at the knees.

e. The back shall be kept as straight as possible and abdominal muscles should be tightened.

f. To lift the object, the legs are straightened from their bending position.

g. A worker shall never carry a load that cannot be seen over or around.

h. When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

1.6.15 Airfield Traffic Control

Aircraft traffic is of concern during periods of reduced visibility when aircraft are conducting instrument landing approaches. Also, while working in aircraft taxi areas personnel shall wear an orange safety vest at all times and have the work zone clearly delineated. Field personnel will only access airport flight lines when escorted by an authorized representative of the Federal Aviation Administration. Normal airport security and restriction of unauthorized personnel on, or around flight lines will ensure that only trained individuals access designated areas where site activities are conducted. Personnel will always maintain at least a 250 foot boundary from active runways.

1.6.16 Contaminated Soil

If contaminated soil is encountered during excavation activities, the project activities shall cease and the Contracting Officer shall be notified. Whenever possible, personnel should avoid contact with contaminated (or potentially contaminated) surfaces. Personnel should walk around (not through) puddles and discolored surfaces. Personnel should not kneel or set equipment on potentially contaminated ground.

1.6.17 Excavations

Any excavation 5 feet deep or greater into which persons will enter and perform work will be shored, sloped, or otherwise made safe for entry. Excavations less than 5 feet in depth and which a competent person examines and determines there to be no potential for cave-in do not require protective systems. All excavations will be performed from a stable ground position. Daily inspections of the excavation will be made. The inspector will determine the likelihood of a cave-in, and remedial action such as sloping or shoring will be taken if the walls appear to be unstable. The inspector shall verify that adequate means of egress are in place. All spoil will be located at least 2 feet from the edge of the excavation to prevent it from falling back into the excavation. Perimeter protection will be used for all excavation activities at the site, consisting of warning barricades and tape placed at a distance not closer than 6 feet from the edge of the excavation, and displays adequate warning at an elevation of 3 feet to 4 feet above ground. Army personnel will participate in the site-specific training session and be instructed on the following requirements

- a. Before excavating, the existence and location of underground pipe, electrical equipment, and gas lines will be determined and documented. If the locations of any lines are in question, a cable avoiding tool will be used to positively locate them.
- b. No ignition sources are permitted if the ambient airborne concentration of flammable vapors exceeds 10 percent of the lower explosive limit (LEL) during the excavation. A combustible gas indicator (CGI) will be used to make this determination.
- c. Operations will be suspended and the area vented if the airborne flammable concentration reaches 10 percent of the LEL in the area of an ignition source (i.e., sparks from bucket of excavator).
- d. Combustible gas readings of the general work area will be made regularly.
- e. If excavating equipment is located in the vicinity of overhead power lines, 29 CFR 1926 Section .955, Overhead Lines, will be used to determine safe working distances.
- f. Ladders will be provided and placed at an angle not more than 30 degrees from vertical, and secured as necessary. Ladder side rails shall extend at least 3 feet above the ground surface.
- g. Excavations greater than four feet in depth that require personnel to enter will have sufficient means of entry and egress (stairs, ladders, ramps). Means of entry/egress will not require personnel to travel laterally more than 25 feet.
- h. Excavations occurring within 3 feet of communication cables will be performed by hand digging until the cable is exposed.

1.7 PLANNED UTILITY OUTAGES AND STREET CLOSURES

All utility outages and street closures shall be of as short a duration as possible and shall be scheduled as far in advance as possible with the Contracting Officer, in no case less than 14 days before the outage or closure. The Contractor shall obtain in writing from the

Contracting Officer a statement or schedule giving the permissible times of outages or closures for particular installations and the maximum time allowed for each. The Contractor shall strictly observe such schedules and will be held responsible for any violations.

(A) Street Closure:

The Contractor shall obtain approval in writing from the Contracting Officer before he can close any street or parking lot access. The request for closure shall be submitted in writing to the Contracting Officer 7 working days prior to planned closing and shall include the section to be closed and length of time of closure.

Power outages shall be restricted to off-duty hours and weekends. Other utilities may be connected and streets closed during normal working hours with the outage duration and street closure as short as possible. All outages and street closures shall be scheduled as far in advance as possible with the Contracting Officer and in no case less than 14 days before the outage or closure. The Contractor shall obtain in writing from the Contracting Officer a statement or schedule giving the permissible times of utility outages or road closures for particular installations and the maximum time allowed for such outage. The Contractor shall strictly observe such schedules and will be held responsible for any violations.

(A) Street Closure:

The Contractor shall obtain approval in writing from the Contracting Officer before he can close any street or parking lot access. The request for closure shall be submitted in writing to the Contracting Officer 7 working days prior to planned closing and shall include the section to be closed and length of time of closure.

Utility outages and street closures shall be restricted to off-duty hours and weekends, with the outage duration and street closure as short as possible. All outages and street closures shall be scheduled as far in advance as possible with the Contracting Officer and in no case less than 14 days before the outage or closure. The Contractor shall obtain in writing from the Contracting Officer a statement or schedule giving the permissible times of utility outages or road closures for particular installations and the maximum time allowed for such outage. The Contractor shall strictly observe such schedules and will be held responsible for any violations.

All utility outages and street closures shall be of as short a duration as possible and shall be scheduled as far in advance as possible with the Contracting Officer, in no case less than 14 days before the outage or closure. The Contractor shall obtain in writing from the Contracting Officer a statement or schedule giving the permissible times of outages or closures for particular installations and the maximum time allowed for each. The Contractor shall strictly observe such schedules and will be held responsible for any violations. Before any outage or closure is scheduled, the Contractor will: 1) Have all approved materials necessary for the outage on hand, 2) Have completed, tested and been inspected by the Construction Quality Control Representative all preliminary work, 3) Prepare an accepted hazard analysis in accordance with section "ACCIDENT PREVENTION", 4) Have all permits and personnel

qualifications on hand, 5) Have held a joint inspection with a representative of the Contracting Officer and the Construction Quality Control Representative.

1.8 EXCAVATION PERMITS

All excavation permits will be issued to the Contractor from the Base Civil Engineer (BCE) through the Contracting Officer. The appropriate form, for this request, may be obtained from the Contracting Officer. Processing time required by the BCE is 14 calendar days. Questions concerning the excavation permit should be directed to the Contracting Officer.

1.9 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

(A) This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSE, Section 00700, entitled "DEFAULT (FIXED-PRICE CONSTRUCTION)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

(B) The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS BASED ON (5) DAY WORK WEEK

BEALE AFB/MARYSVILLE

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(07)	(06)	(05)	(04)	(01)	(00)	(00)	(00)	(01)	(02)	(05)	(07)

(C) Upon acknowledgement of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the Contractor's scheduled work day.
(ER 415-1-15, 31 OCT 89)

1.10 EQUIPMENT DATA FORM

In conjunction with paragraph, EFARS 52.231-5000 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE, in Section 00800, the Contractor shall

furnish SPK Form 450 for all necessary equipment to perform work requiring adjustment of contract price and shall submit these forms with the modification proposals. A sample form is at the end of this section.

1.11 HAUL ROUTE PLAN

The Contractor shall submit a detailed haul route for Government Approval. This plan shall include offices, material storage areas and structures and the access routes to these areas. Haul routes from the sites through the military reservations to major highways shall be indicated. All required traffic signs, special limits, warning devices, lighting and other such safety devices required by EM 385-1-1, OSHA, local cities and Cal Trans (on state roads) shall be shown. Provisions shall be made in the plan for alternate routes when excavations block designated haul routes. The plan shall be revised and resubmitted if the haul routes being used are not as shown on the plan.

(A) Coordination with Technical Specifications:

Work for sections such as Demolition, Grading, Tree Removal and other sections with excavations shall be coordinated with this plan.

(B) Protection of Land Resources:

This Haul Plan shall include the requirements of SECTION: ENVIRONMENT PROTECTION especially paragraph, PROTECTION OF LAND RESOURCES and all the clauses referenced therein.

1.12 AIRFIELD FOREIGN OBJECT DAMAGE (FOD)

(A) Clean up:

Contractor shall be responsible for the cleanliness of his work areas at all times during his contract performance. This shall include but not be limited to immediate clean-up of any material that may spread onto aircraft taxiways, aprons, ramps and pads. Contractor shall provide a pavement vacuum/sweeper at the project site at all times during his performance. Every time any haul vehicles cross the taxiways, aprons, ramps and pads, the area shall be cleaned by the pavement vacuum/sweeper immediately. The Contractor shall be responsible for repair or replacement of any foreign object damages to the aircrafts or components of the aircrafts resulting from his negligence.

1.13 CONTRACTOR SAFETY PERSONNEL REQUIREMENTS (1985 JAN HQ USACE)

(A) Full-time, on-site, safety coverage by contractors shall be required for the life of the contract.

(B) The following conditions shall be met:

(1) The Contractor shall employ, to cover all hours of work at the project site(s), at least one safety and health person to manage the Contractor's safety program; duties which are not germane to the safety program shall not be assigned to this person(s). The principal safety and health person shall report to and work directly for the Contractor's top

on-site manager, corporate safety office, or other high-level official of equivalent position. The safety and health person(s) shall have the authority to take immediate steps to correct unsafe or unhealthful conditions. The employment of a safety and health person(s) shall not abrogate the safety and health responsibilities of other personnel.

(2) Qualifications for Safety and Health Person(s).

(a) Safety and Health Person(s) shall have a degree in engineering or safety in at least a four year program from an accredited school and shall have been engaged in safety and occupational health for at least one (1) year of experience (no time being credited to this one (1) year unless at least fifty (50) percent of the time was devoted to safety and occupational health) and shall have at least one (1) year experience in construction, or--

(b) Safety and Health Person(s) shall have legal registration as a Professional Engineer or a Certified Safety Professional and shall have been engaged in safety and occupational health for at least one (1) year of experience (no time being credited to this one (1) year unless at least fifty (50) percent of the time was devoted to safety and occupational health) and shall have at least one (1) year experience in construction, or--

(c) Safety and Health Person(s) shall have a degree other than that specified in paragraph, Qualifications for Safety and Health Person(s) above, and shall have been engaged in safety and occupational health for at least three (3) years of experience (no time being credited to these three (3) years unless at least fifty (50) percent of the time each year was devoted to safety and occupational health) and shall have at least two (2) years experience in construction, or--

(d) In lieu of a degree, Safety and Health person(s) shall have been engaged in safety and occupational health for at least five (5) years of experience (no time being credited to these five (5) years unless at least fifty (50) percent of the time each year was devoted to safety and occupational health) and shall have at least two (2) years experience in construction.

(e) First aid work is not a creditable experience.

(3) The name and qualifications of the nominated safety and health person(s) shall be furnished to the Contracting Officer for acceptability and a functional description of duties shall be provided prior to the pre-work conference.

NOTE: The Contractor shall have one or more Safety and Health Persons, each of whom meets the qualifications of (B)(2) Qualifications for Safety and Health Person(s), physically present on the actual site of the work whenever work of any sort is being performed by a Contractor, subcontractor, or supplier personnel on the work site. The foregoing clause language shall not be interpreted to contravene this note.

1.14 MONTHLY SAFETY INSPECTION

A monthly on-site inspection will be made by the insurance carriers of the prime and subcontractors. The Contractor's safety program will be reviewed and a meeting will be held with the Contracting Officer's Representative to discuss the job-site safety. A written report will be made by the

Contractor stating the results of the inspection and the action taken.

1.15 AREAS OF RADAR RADIATION HAZARD

The work under this contract is to be performed in, or in the vicinity of, areas that may be hazardous at times due to radar radiation. Construction activities and Contractor's personnel shall not be allowed within such areas without prior arrangement with and the approval of the Contracting Officer. The Contractor shall maintain a close working relationship with the Contracting Officer's representative and shall govern his activities within such areas as said representative may arrange with operating personnel of the Air Force.

1.16 HAZARDOUS NOISE AREA

Work area for this contract is located within a high noise area and can be hazardous to the human ear. The Contractor is responsible for providing adequate ear protection as may be required for Contractor's personnel at the job site.

1.17 COLOR SCHEME FOR CONTRACTOR FACILITIES

(A) All Contractor storage and operational facilities including temporary structures, signs and fencing, that remain at the site shall be compatible with the color scheme used on the project signs as directed by the Contracting Officer.

1.18 WARRANTY OF CONSTRUCTION

(a). Performance Bond.

(1). It is understood that the Contractor's Performance Bond will remain effective throughout the life of all warranties and warranty extensions.

(2). In the event the Contractor or his designated representative fails to commence and diligently pursue any work required under the Warranty of Construction Section of the Technical Provisions within a reasonable time after receipt of written notification pursuant to the requirements thereof, the Contracting Officer shall have a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Contracting Officer shall have the work performed by others, and after completion of the work, shall make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

(3). Warranty repair work which arises to threaten the health or safety of personnel, the physical safety of property or equipment, or which impairs operations, habitability of living spaces, etc., will be handled by the Contractor on an immediate basis as directed verbally by the Contracting Officer or his authorized representative. Written verification will follow verbal instructions. Failure of the Contractor to respond as verbally directed will be cause for the Contracting Officer or his authorized representative to have the warranty repair work performed by others and to proceed against the Contractor as outlined in the paragraph b. above.

(b). Pre-Warranty Conference. Prior to contract completion and at a time designated by the Contracting Officer or his authorized representative, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of SECTION 00700, Paragraph, WARRANTY OF CONSTRUCTION, of this specification. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer or his authorized representative for the execution of the construction warranty shall be established/reviewed at this meeting.

In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This single point of contact will be located within the local service area of the warranted construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with Section 00700, Paragraph, WARRANTY OF CONSTRUCTION.

(c). Equipment Warranty Identification Tags. The Contractor shall provide warranty identification tags on all equipment installed under this contract.

(d). Contractor's Response to Warranty Service Requirements. The following warranty service requirements are applicable to this contract. Following notification by the Contracting Officer or the Contracting Officer's Representative the Contractor shall respond to a warranty service requirement identified by the Contracting Officer's Representative in accordance with the "Warranty Service Priority List" of this program. This list prioritizes warranty work into the categories:

First Priority 1A Perform on site inspection to evaluate situation, determine course of action, initiate work within 24 hours and work continuously to completion or relief.

Second Priority 1B Perform on site inspection to evaluate situation, determine course of action, initiate work within 48 hours and work continuously to completion of relief.

Third Priority All other work to be initiated within 5 work days and work continuously to completion or relief.

The "Warranty Service Priority List" shall be compiled by the Contractor and approved by the Contracting Officer.

Should parts be required to complete the work and the parts are not immediately available the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Contracting Officer's Representative with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Contracting Officer's Representative will evaluate the proposed

alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition.

Alternatives considered by the Contracting Officer's Representative will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

1.19 FINAL EXAMINATION AND ACCEPTANCE

(A) As soon as practicable after the completion of the entire work or any section thereof (if the work is divided into sections) as in the opinion of the Contracting Officer will not be subject to damage by further operations under the contract, such work will be thoroughly examined at the cost and expense of the Government by sounding or by sweeping, or both, as determined by the Contracting Officer. Should any shoals, lumps, or other lack of contract depth be disclosed by this examination the Contractor will be required to remove same by dragging the bottom or by dredging at the contract rate for dredging, but if the bottom is soft and the shoal areas are small and form no material obstruction to navigation, the removal of such shoal may be waived by the discretion of the Contracting Officer. The Contractor or his authorized representative will be notified when soundings and/or sweepings are to be made, and will be permitted to accompany the survey party. When the area is found to be in a satisfactory condition, it will be accepted finally. Should more than two sounding or sweeping operations by the Government over an area be necessary by reason of work for the removal of shoals disclosed at a prior sounding or sweeping, the cost of such third and any subsequent sounding or sweeping operations will be charged against the Contractor at the rate of \$1,000.00 per day for each day in which the Government plant is engaged in sounding or sweeping and/or is enroute to or from the site or held at or near the said site for such operations.

(B) Final acceptance of the whole or a part of the work and the deductions or corrections of deductions made thereon will not be reopened after having once been made, except on evidence of collusion, fraud, or obvious error, and the acceptance of a completed section shall not change the time of payment of the retained percentages of the whole or any part of the work.

1.20 Special Construction Procedures

(A) Contractor shall obtain temporary passes from the Government for all of their personnel.

(B) Contractor shall be responsible for all Mud Control at Roadways next to Project site. For additional information regarding Mud Control, Contractor shall contact the Contracting Officer.

(C) Contractor shall be given full access and allowed to demolish the existing control tower only after the new control tower has been completely certified as operational.

(D) The Contractor shall not have access to the existing control tower for demolition purposes until June 03, 2002.

(E) The Government will be salvaging equipment from the existing tower, for

transfer to the new tower (Government Furnished/government Installed), up until the time the existing tower is turned over to the Contractor for demolition.

(F) The demolition Contractor needs to be aware, that due to the close proximity of the existing tower to an existing facility (air operations Building), located east of the tower. Special precautions need to be taken and coordinated, to insure **demolition activities don't interfere at anytime with adjacent building operations. In addition to General Safety Requirements (EM385-1-1), Contractor shall ensure at all times safe access, to the Operations Building.**

(G) The Contractor shall coordinate with local governing agencies (Feather River Air Quality or other County enforcement boards), and obtain any required air/water quality regulatory permits. This will extend to, but not be limited to, authorities to construct/operate diesel generators, boiler units and fuel tanks, which are part of this project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

The Contractor shall furnish and maintain at the jobsite, in good condition one 3 m straightedge for testing the concrete surface. The straightedge shall be made available for Government use. The straightedge shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, reinforced to insure rigidity and accuracy. Straightedge shall have handles to facilitate movement on the concrete surface.

PART 2 PRODUCTS

2.1 CONCRETE

2.1.1 Integral Color Concrete

Concrete shall conform to the applicable requirements of Section: 03300 CONCRETE FOR BUILDING CONSTRUCTION except as otherwise specified. Colored concrete shall have an integral color of "Padre Brown," Davis Colors or approved equal. Mix and formulation shall be as per manufacturer specifications. Finish shall be a medium sand blast finish for all exposed surfaces as noted on details.

2.1.1.1 Compression Strength

Concrete shall have a minimum compressive strength of 21 mPa at 28 days. The maximum size of aggregate shall be as per integral color manufacturer specifications.

2.1.1.2 Air Content

Mixtures may have air content by volume of concrete of 3 to 5 percent, based on measurements made immediately after discharge from the mixer.

2.1.1.3 Slump

The concrete slump shall be **75mm** plus or minus **25mm** where determined in accordance with ASTM C 143.

2.1.2 Pedestrian Traffic Concrete

2.1.2.1 Compression Strength

Pedestrian traffic concrete shall have a minimum compressive strength of 21mPa at 28 days. The maximum size of aggregate shall be 25 mm minus.

2.1.2.2 Air Content

Mixtures may have air content by volume of concrete of 3 to 5 percent, based on measurements made immediately after discharge from the mixer.

2.1.2.3 Slump

The concrete slump shall be **75mm** plus or minus **25mm** where determined in accordance with ASTM C 143.

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16710

PREMISES DISTRIBUTION SYSTEM

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
- 1.3 ENVIRONMENTAL REQUIREMENTS
- 1.4 QUALIFICATIONS
 - 1.4.1 Minimum Contractor Qualifications
 - 1.4.2 Minimum Manufacturer Qualifications
- 1.5 SUBMITTALS
- 1.6 DELIVERY AND STORAGE
- 1.7 OPERATION AND MAINTENANCE MANUALS
- 1.8 RECORD KEEPING AND DOCUMENTATION
 - 1.8.1 Cables
 - 1.8.2 Termination Hardware

PART 2 PRODUCTS

- 2.1 MATERIALS AND EQUIPMENT
- 2.2 UNSHIELDED TWISTED PAIR CABLE SYSTEM
 - 2.2.1 Cable Insulation
 - 2.2.2 Riser Cable
 - 2.2.3 Horizontal Cable
 - 2.2.4 Connecting Hardware
 - 2.2.4.1 Telecommunications Outlets
 - 2.2.4.2 Patch Panels
 - 2.2.4.3 Patch Cords
 - 2.2.4.4 Terminal Blocks
- 2.3 CABLE TELEVISION SYSTEM
 - 2.3.1 Cable Television Coaxial Cable
 - 2.3.2 Cable Television Connectors
- 2.4 FIBER OPTIC CABLE SYSTEM
 - 2.4.1 Singlemode
 - 2.4.2 Connecting Hardware
 - 2.4.2.1 Connectors
 - 2.4.2.2 Patch Panels
- 2.5 EQUIPMENT CABINETS
 - 2.5.1 Cable Guides
 - 2.5.2 Floor Mounted Cabinets
 - 2.5.3 Wall Mounted Cabinets
- 2.6 EQUIPMENT MOUNTING BACKBOARD
 - 2.6.1 Backboard Configuration
- 2.7 TELECOMMUNICATIONS OUTLET BOXES

PART 3 EXECUTION

- 3.1 INSTALLATION

- 3.1.1 Horizontal Distribution Cable
- 3.1.2 Riser and Backbone Cable
- 3.1.3 Telecommunications Outlets
 - 3.1.3.1 Faceplates
 - 3.1.3.2 Cables
 - 3.1.3.3 Pull Cords
- 3.1.4 Terminal Blocks
- 3.1.5 Unshielded Twisted Pair Patch Panels
- 3.1.6 Fiber Optic Patch Panels
- 3.1.7 Equipment Cabinets And Racks
- 3.1.8 Cabinet And Rack Mounted Equipment
- 3.2 TERMINATION
 - 3.2.1 Unshielded Twisted Pair Cable
 - 3.2.2 Cable Television Coaxial Cable
 - 3.2.3 Fiber Optic Cable
- 3.3 GROUNDING
- 3.4 ADDITIONAL MATERIALS
- 3.5 ADMINISTRATION AND LABELING
 - 3.5.1 Labeling
 - 3.5.1.1 Labels
 - 3.5.1.2 Cable
 - 3.5.1.3 Termination Hardware
- 3.6 TESTING
 - 3.6.1 Test Plan
 - 3.6.2 Test Documentation
 - 3.6.3 Test Equipment
 - 3.6.4 Unshielded Twisted Pair Tests
 - 3.6.5 Category 5e Circuits
 - 3.6.6 Cable Television Coaxial Cable
 - 3.6.7 AS-BUILT DRAWINGS
 - 3.6.8 Warranty and Services
 - 3.6.9 Installation Warranty
 - 3.6.10 Cabling System Warranty

-- End of Section Table of Contents --

SECTION 16710

PREMISES DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA ANSI/TIA/EIA-568-(2001) B.1, B.2, B.3	Commercial Building Telecommunications Cabling Standard
I3A	(2000) Technical guide for installation information infrastructure architecture I3A implementation version 3.
EIA ANSI/TIA/EIA-568-B.1	(2001) Field testing requirements.
EIA ANSI/TIA/EIA-568-B.2	(2001) Cabling system requirements.
EIA ANSI/TIA/EIA-568-B.3	(2001) Optical fiber cabling systems requirements.
EIA ANSI/TIA/EIA-569-A	(2000) Pathways and spaces
EIA ANSI/TIA/EIA-569-A	(2001) Commercial Building Standard for Telecommunications Pathways and Spaces
EIA ANSI/TIA/EIA-606	(2000) Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
EIA ANSI/TIA/EIA-607	(2001) Commercial Building Grounding and Bonding Requirements for Telecommunications. New name TIA/EIA-J-STD-037.
EIA TSB 67	(1995) Transmission Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems
EIA TSB 72	Centralized Optical Fiber Cabling Guidelines (latest revision)
EIA TSB 75	Additional Horizontal Cabling Practices for Open Offices (Latest revision)
SP-4655	Building Automation Systems (Latest revision)

IBM PUBLICATION CORPORATION (IBM)

IBM GA27-3361-07 (1987) LAN Cabling System - Planning and Installation

IBM GA27-3773-0 (1987) Cabling System Technical Interface Specifications

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-80-576 (1994) Communications Wire and Cable for Wiring of Premises

ICEA S-83-596 (1994) Fiber Optic Premises Distribution Cable

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999; Errata) National Electrical Code

UNDERWRITERS LABORATORY (UL)

UL 50 (1995; Rev thru Oct 1997) Enclosures for Electrical Equipment

IEEE

IEEE 802.3ae (2001) Fiber cabling objectives.

1.2 SYSTEM DESCRIPT

1.2 SYSTEM DESCRIPTION

The Contractor shall provide a premises telecommunications system that is a structured cabling system. The premises distribution system shall consist of inside-plant horizontal, riser, and backbone cables and connecting hardware to transport telephone and data (including LAN) signals between equipment items in a single or multi-story building. The premises telecommunications cabling system shall be backed by a manufacturer's 15-Year Performance Warranty. The performance warranty shall be facilitated by the telecommunications contractor and be established between the User and the cabling system manufacturer.

1.3 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of 0 to 60 degrees C and in the range of 0 to 95 percent relative humidity, noncondensing. All new telecommunications rooms shall be environmentally controlled to 64 degrees F to 75 degrees F, with humidity range between 30% to 55% RH. Provide dust and static electricity free environments by installing floor tile and treating walls and ceiling to minimize dust. Provide the same (Key) locks on all comm closet doors: Coordinate with the contracting Officer.

1.4 QUALIFICATIONS

1.4.1 Minimum Contractor Qualifications

All work under this section shall be performed by and all equipment shall

be furnished and installed by a certified Telecommunications Contractor, hereafter referred to as the Contractor. With the exception of furnishing and installing conduit, electrical boxes, and pullwires, this work shall not be done by the Electrical Contractor. The Telecommunications contractor shall be required to furnish all labor, supervision, tooling miscellaneous mounting hardware and consumables for the premises telecommunications cabling system. The contractor shall maintain current approval certification status with the warranting manufacturer for the specified Category rating and type of copper and fiber optic cable and connecting hardware and modular components, including all training requirements, for the duration of the installation and acceptance of the premises telecommunications system part of the project. The contractor shall staff each installation crew with the appropriate number of trained personnel, in accordance with their manufacturer/warranty contact agreement, to support the 15-Year Performance Warranty requirements. After installation, the Contractor shall submit all documentation to support the warranty in accordance with the manufacturer's warranty requirement, and to apply for said warranty on behalf of the User. The warranty shall cover the components and labor associated with the repair/replacement of any failed link within the warranty period. The Contractor shall have the following qualifications in Telecommunications Systems installation:

- a. Contractor shall have a minimum of 3 years experience in the application, installation and testing of the specified systems and equipment.
- b. All supervisors and installers assigned to the installation of this system or any of its components shall have factory certification from each equipment manufacturer that they are qualified to install and test the provided products. General electrical trade staff (electricians) shall not be used for the installation of the premises distribution system cables and associated hardware.
- c. All installers assigned to the installation of this system or any of its components shall have a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components.

1.4.2 Minimum Manufacturer Qualifications

The equipment and hardware provided under this contract will be from manufacturers that have a minimum of 3 years experience in producing the types of systems and equipment specified.

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Spare Parts; FIO.

Lists of spare parts, tools, and test equipment for each different item of material and equipment specified, after approval of detail drawings, not later than 2 months prior to the date of beneficial occupancy. The data

shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking.

SD-04 Drawings

Premises Distribution System; GA.

Detail drawings including a complete list of equipment and material. Detail drawings shall contain complete wiring and schematic diagrams and other details required to demonstrate that the system has been coordinated and will function properly as a system. Drawings shall include vertical riser diagrams, equipment rack details, elevation drawings of telecommunications closet walls, outlet face plate details for all outlet configurations, sizes and types of all cables, conduits, and cable trays. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation.

Record Drawings; FIO.

Record drawings for the installed wiring system infrastructure per EIA ANSI/TIA/EIA-606. The drawings shall show the location of all cable terminations and location and routing of all backbone and horizontal cables. The identifier for each termination and cable shall appear on the drawings.

SD-06 Instructions

Manufacturer's Recommendations; FIO.

Where installation procedures, or any part thereof, are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations, prior to installation shall be provided. Installation of the item will not be allowed to proceed until the recommendations are received and approved.

SD-08 Statements

Test Plan; FIO.

Test plan defining the tests required to ensure that the system meets technical, operational and performance specifications, 60 days prior to the proposed test date. The test plan must be approved before the start of any testing. The test plan shall identify the capabilities and functions to be tested, and include detailed instructions for the setup and execution of each test and procedures for evaluation and documentation of the results.

Qualifications; FIO.

The qualifications of the Manufacturer, Contractor, and the Installer to perform the work specified herein. This shall include proof of the minimum qualifications specified herein.

SD-09 Reports

Test Reports; FIO.

Test reports in booklet form with witness signatures verifying execution of

tests. Test results will also be provided on 89 mm diskettes in ASCII format. Reports shall show the field tests performed to verify compliance with the specified performance criteria. Test reports shall include record of the physical parameters verified during testing. Test reports shall be submitted within 7 days after completion of testing.

SD-13 Certificates

Premises Distribution System; FIO.

Written certification that the premises distribution system complies with the EIA ANSI/TIA/EIA-568-A, EIA ANSI/TIA/EIA-569, and EIA ANSI/TIA/EIA-606 standards.

Materials and Equipment; FIO.

Where materials or equipment are specified to conform, be constructed or tested to meet specific requirements, certification that the items provided conform to such requirements. Certification by a nationally recognized testing laboratory that a representative sample has been tested to meet the requirements, or a published catalog specification statement to the effect that the item meets the referenced standard, will be acceptable as evidence that the item conforms. Compliance with these requirements does not relieve the Contractor from compliance with other requirements of the specifications.

Installers; FIO.

The Contractor shall submit certification that all the installers are factory certified to install and test the provided products. Documentation of qualifications and test equipment proficiency shall be provided to the Base Com, Larry Davis, 9CS/SCXP (530) 634-3226, before installation of any telecommunications cabling, hardware, or equipment.

SD-18 Records

Record Keeping and Documentation; GA.

Documentation on cables and termination hardware in accordance with EIA ANSI/TIA/EIA-606.

1.6 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust or other contaminants. Equipment delivered and found not to be placed in approved storage shall be left in place and replaced with new equipment. Only after replacement equipment is on site and in approved storage, shall original equipment be allowed to be removed from the site.

1.7 OPERATION AND MAINTENANCE MANUALS

Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance for all products provided as a part of the premises distribution system. Specification sheets for all cable, connectors, and other equipment shall be provided.

1.8 RECORD KEEPING AND DOCUMENTATION

1.8.1 Cables

A record of all installed cable shall be provided in hard copy format and on electronic media using Windows based computer cable management software per EIA ANSI/TIA/EIA-606. A licensed copy of the cable management software including documentation, shall be provided. The cable records shall include the required data fields for each cable and complete end-to-end circuit report for each complete circuit from the assigned outlet to the entry facility per EIA ANSI/TIA/EIA-606.

1.8.2 Termination Hardware

A record of all installed patch panels and outlets shall be provided in hard copy format and on electronic media using Windows based computer cable management software per EIA ANSI/TIA/EIA-606. A licensed copy of the cable management software including documentation, shall be provided. The hardware records shall include only the required data fields per EIA ANSI/TIA/EIA-606.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall be the manufacturer's latest standard design that has been in satisfactory use for at least 1 year prior to installation. Materials and equipment shall conform to the respective publications and other requirements specified below and to the applicable requirements of NFPA 70.

2.2 UNSHIELDED TWISTED PAIR CABLE SYSTEM

Provide Category 5e, enhanced, for voice and data circuits.

2.2.1 Cable Insulation

For each individual Category 5e, 4-pair cable, the insulation, material used on each of the 4 pair cables shall be exactly the same in all physical, electrical, and chemical respects. The use of Teflon insulated, plenum rated Category 5e cable is acceptable for both plenum and non-plenum applications. If Teflon insulated plenum rated cable is used by the Contractor, it shall be Type 4x0, where all four pairs are Teflon insulated. and specified to handle transmission speeds at a minimum of 100 Mhz. Type 3x1 and 2x2 are not acceptable.

2.2.2 Riser Cable

Riser cable shall meet the requirements of ICEA S-80-576 and EIA ANSI/TIA/EIA-568-B.1, B.2, B.3 for Category 5e 100-ohm unshielded twisted pair cable and fiber. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Conductors shall be solid untinned copper 24 AWG. Cable shall be rated CMR or CMP per NFPA 70.

2.2.3 Horizontal Cable

Horizontal cable shall meet the requirements of EIA ANSI/TIA/EIA-568-B.1, B.2 for Category 5e, four-pair 100 ohm, 24 gauge American Wire Gauge (AWG), Unshielded Twisted Pair (UTP) horizontal cable, with insulation (4x0) with

100 percent Fluorinated Propylene type (FEP) for UTP non-plenum or Teflon (CMP) for UTP plenum rated. horizontal cable. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and Category 5e as applicable, performance level. Conductors shall be solid untinned copper 24 AWG. Cables with any part distributed exposed on the overhead cable tray shall be CMP per NFPA 70; otherwise, it shall be rated CMG per NFPA 70 if the entire length is in conduit or any part is exposed in cable tray under raised floors not used as plenums. Cable shall be rated CMG or CMP as required per NFPA 70.

2.2.4 Connecting Hardware

Connecting and cross-connecting hardware shall be the same category as the cable it serves. Hardware shall be in accordance with and EIA ANSI/TIA/EIA-568-B.1, B.2 and I3A.

2.2.4.1 Telecommunications Outlets

Control tower facilities wall and desk outlet plates shall come equipped with two Category 5e modular jacks, with the top left jack labeled "voice" and the bottom right jack labeled "data". All modular jacks shall be category 5e and shall conform to the requirements of ANSI/TIA/EIA-568-B.1 & B.2 as the cable they terminate and shall meet the requirements of EIA ANSI/TIA/EIA-568-B.1 & B.2 for Category 5e (enhanced). Modular jack pin/pair configuration shall be T568B per EIA ANSI/TIA/EIA-568-B.1 & B.2. Modular jacks shall be unkeyed. Faceplates shall be provided and shall be ivory in color, impact resistant plastic. Outlet assemblies used in the premises distribution system shall consist of modular jacks assembled into both simplex and duplex outlet assemblies in single covers as specified in this section and/or as indicated on the drawings. The modular jacks shall conform to the requirements of EIA ANSI/TIA/EIA-568-B.1 & B.2, Category 5e.

2.2.4.2 Patch Panels

Unshielded Patch panels shall be Category 5e rated, 480mm (19 inch) rackmounted, with an attached wire management device. The front panel shall consist of 8-pin, eight-position, R-45J modular jacks. The rear panel shall consist of color-coded, type 110 connections and with 4-pair connecting blocks. The rear of the patch panel shall have a wire management system installed for the proper routing of installed cables. A wire management system shall also be provided between each patch panel for proper routing of patch cords. Patch panels shall be high density with 48 RJ-45 connector ports and the required quantity of patch panels shall provide sufficient modular jacks to accommodate the installed floor and wall area outlets, plus 10 percent spares. Jack pin/pair configuration shall be T568B per EIA ANSI/TIA/EIA-568-B.1 & B.2. Jacks shall be unkeyed. Panels shall be labeled with alphanumeric x-y coordinates and be provided with labeling space.

2.2.4.3 Patch Cords

Patch cords shall be modular cable assemblies consisting of 4-pair flexible ivory jacketed, twisted pair stranded wire unshielded with eight-position (4-pair) modular RJ-45 plugs at each end for cross-connecting at each patch panel. Patch cords with modular RJ-45 plugs shall include color coded protective RJ-45 boots for voice and data patch panels at each end. Unless otherwise directed by the Government communications point of contact, color coded RJ-45 shall be red for voice, and lavender for data. Any alarm or environmental analog bypasses shall be yellow.. Cable shall be

label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Patch cords shall be wired straight through; pin numbers shall be identical at each end and shall be paired to match T568B patch panel jack wiring per EIA ANSI/TIA/EIA-568-B.1 & B.2. Patch cords shall be unkeyed. Patch cords shall be Category 5e compliant and shall be factory assembled. Patch cords shall be of the required length to maintain a neat and organized installation, and shall not exceed a length of 20 feet each.

2.2.4.4 Terminal Blocks

Terminal blocks shall be wall mounted and/or rack mounted (as indicated in this specification or on the drawings) wire termination units consisting of 4-pair connecting blocks, detachable legs, clear label holders with white designation labels and in 100-pair configurations. Blocks shall be type 110 which meet the requirements of EIA ANSI/TIA/EIA-568-B.1 & B.2 for category 5e (enhanced). Blocks shall be mounted on standoffs and shall include cable management hardware. 4-pair connecting blocks shall terminate 22 or 24 gauge solid copper wire as a minimum, and shall be connected in pairs so that horizontal cable and connected 4-pair jumper wires are on separate connected terminals. Terminal blocks shall be mounted in orderly rows and columns. Adequate vertical and horizontal wire routing areas for cable guides shall be provided between groups of blocks. Industry standard wire routing cable guides shall be provided.

2.3 CABLE TELEVISION SYSTEM

The Contractor shall coordinate Base Communications Section Larry Davis 9CS/SCXP on TV systems (530) 634-3226.

2.3.1 Cable Television Coaxial Cable

The coaxial cable shall have a characteristic impedance of 75 ohms plus or minus 3 ohms. Cable shall have shielding which provides at least 95 percent coverage. RG-6/U cable shall be used as indicated on the drawings. Coaxial cable construction shall conform to NEC article 820 for type CATV cable. All cable components shall be able to withstand the environment the cable is installed in for a minimum of 20 years. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization or performance level.

2.3.2 Cable Television Connectors

Connectors for RG-6/U and RG-11/U coaxial cable shall be F-type connectors designed for usage with the coaxial cable specified. Connectors shall be either crimp-on or solder type per NFPA 70.

2.4 FIBER OPTIC CABLE SYSTEM

2.4.1 Singlemode

For Singlemode fiber optic cable EIA ANSI/TIA/EIA-568-B.1 & B.3 and requirements see specification Section 16711, Tephone System, Outside Plant.

2.4.2 Connecting Hardware

2.4.2.1 Connectors

Connectors shall be SC type with ceramic ferrule material with a maximum insertion loss of .5 dB. Connectors shall meet performance requirements of

EIA ANSI/TIA/EIA-568-A and ANSI/TIA/EIA-568-B.1 & B.2. Connectors shall be field installable. Connectors shall utilize adhesive for fiber attachment to ferrule. Connectors shall terminate fiber sizes as required for the service. The pull strength between the connector and the attached fiber shall be not less than 11.3 kg. the mated pair loss, without rotational optimization, shall not exceed 1.0 db.

2.4.2.2 Patch Panels

Provide 480mm (19 inch) rack-mountable 12/24, port fiber optic splicing and patching panel. All fibers shall be directly connectorized, no pigtail splices in the fiber patch panels. The panels shall be a complete system of components by a single manufacturer, and shall provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection. Patch panels shall be 480 mm (19 inch) rack mounted panels. Patch panels shall provide strain relief for cables. Panels shall be labeled with alphanumeric x-y coordinates Unless otherwise directed by the DOIM, patch panel connectors shall be SC type for future wall area outlets. Patch panel connectors and couplers shall be SC as directed by DOIM, and of ceramic ferrule material with a maxium insertion loss of 0.5 db. Connectors shall meet performance requirements of EIA ANSI/TIA/EIA-568-B.1 & B.2. Connectors shall be field installable and shall utilize adhesive for fiber attachment to ferrule. Connectors shall terminate fiber sizes as required for the service. The pull strength between the connector and the attached fiber shall be not less than 11.3 kg. The mated pair loss, without rotational optimization, shall not exceed 1.0 db.

2.5 EQUIPMENT CABINETS

2.5.1 Cable Guides

Cable guides shall be specifically manufactured for the purpose of routing cables, wires and patch cords horizontally and vertically on 480 mm (19 inch) equipment racks or when mounted on the plywood backboards. Cable guides shall consist of ring or bracket-like devices mounted on rack panels, or management wireways mounted on plywood backboards for horizontal use or individually mounted for vertical use. Cable guides shall mount to racks by screws and/or nuts and lockwashers. Cable guides shall not exceed 50 percent fill.

2.5.2 Floor Mounted Cabinets

Equipment cabinets shall house incoming fiber, station and equipment blocks, Government furnished port hubs, UPS and other equipment as indicated. Power strips with 6 outlets, with circuit breaker, and 12 foot power cord shall be provided within the cabinet. Cabinet shall be assembled to equipment configuration and upgradable, it shall have horizontal and vertical cable management integral to the cabinet. Cabinet Top shall be vented "ventilation fans will be included, (3 fans with guards-100 CFM per fan)" and provided with 102mm (4 inch) diameter cable access hole, 3 fan assembly provision. Cabinet rear shall have a vented steel door with lock. Cabinet sides shall be enclosed with side panels. Cabinet front shall have an acrylic plastic or plexglas front door with lock, Cabinet bottom shall an opening 362mm (14.25 inch) by 337mm (13.25 inch), caster mounting hole with 7/16-14 thread, and adjustable leveler mounting (hole 1/2-13 thread) with rubber feet. Cabinet shall have adjustable mounting rails for 19 inch mounting. Cabinet shall be 1,220mm

(48 inches) high, 661mm (26 inches) deep and 661mm (26 inches) wide. Cabinet exteriors shall be painted blue. Cabinet shall be centered in front of backboard, position will be as directed by the DOIM. Cabinet shall be properly grounded. The minimum bonding conductor size shall be No. 6 AWG insulated copper. Cabinet shall be anchored to the floor with a 1/4 inch diameter by 3 inch long anchor bolt at each corner of the cabinet.

Provide a decated 20A, 120VAC duplex receptacle, on a separate circuit in bottom of equipment cabinet.

2.5.3 Wall Mounted Cabinets

DEP indoor connector or splice-tail in/quick-clip out eall mounted cabinets shall conform to UL 50 and have boxes constructed of zinc-coated sheet steel.

The BEP indoor building entrance protectors terminate, protect and distribute 25, 50, 100, 200, 400 pair central office cable on the subsciber premises. The BEP shall combine protection and distribution with a built-in splice chamber, lockable cover, Central office pairs are connected with 710 or MS2 connectors, or a field splice-tail during layout of the system contractor shall idenify with the base Larry Davis Communication division 530 634-3226 what is required and the contracting officer. The BEP features are built-in splice chamber, lift-out protector panel, Gold-plated protector contacts, Rugged metal housing made of mil-galvanized 16-gauge steel with 9-step paint process, design to meet bellcore TR-TSY-000299, UL Listed with industry-standard 5-pin protector modules. Cabinet shall be 2.1 m 15 inches high, 4.7 inches deep and 15.41 inches wide.

2.6 EQUIPMENT MOUNTING BACKBOARD

Plywood backboards shall be constructed of 20mm ACX plywood and be coated on both sides and edges with fire retarding, insulating varnish. Plywood backboards shall be, sized as shown, painted with white or light colored paint.

2.6.1 Backboard Configuration

Provide both vertical and horizontal cable management rings and panels on the backboard as required under paragraph 2.6.3 "Cable Guides", of this specification, and as indicated on the drawings.

2.7 TELECOMMUNICATIONS OUTLET BOXES

In accordance with the United States Army Installation Information Infrastructure Architecture (I3A) Design and Implementation Guide, dated 19 May 2000, all administative information outlets shall be dual 8-position type jacks. Dedicated inside and outside plant ducting space for the purpose of fiber optic cable installation into this project to meet the intent and be in accordance with the United Army I3A Architecture guidelines (<http://arch-odisc4.army.mil/I3A/i3a.htm>). Connect all telephone/data outlets from the telephone terminal backboard and/or communications equipment room with two 4-pair, 568-B.1 & B.2 Category 5e, unshielded twisted pair (UTP) solid copper station cable. Connect all single 8-position type wall and pay telephone outlets from the telephone terminal backboard and/or wiring closet with one 4-pair, EIA/TIA 568-B.1 & B.2 Category 5e, UTP sold copper station wire. Project communication/networking and premise distribution plan and installation requirements shall be in accordance with current EIA/TIA 568-B.1 & B.2 and 569-A. Electrical boxes for telecommunication outlets shall be 117 mm square by 53 mm deep with minimum 9 mm deep single or two gang plaster ring.

Provide a minimum 25 mm conduit.

PART 3 EXECUTION

3.1 INSTALLATION

System components and appurtenances shall be installed in accordance with NFPA 70, manufacturer's instructions and as shown. Necessary interconnections, services, and adjustments required for a complete and operable signal distribution system shall be provided. Components shall be labeled in accordance with EIA ANSI/TIA/EIA-606. Penetrations in fire-rated construction shall be firestopped in accordance with Section 07840 FIRESTOPPING. Conduits, outlets and raceways shall be installed in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Wiring shall be installed in accordance with EIA ANSI/TIA/EIA-568-A and ANSI/TIA/EIA-568-B.1 & B.2 and as specified in Section 16415 ELECTRICAL WORK, INTERIOR. Wiring, and terminal blocks and outlets shall be marked in accordance with EIA ANSI/TIA/EIA-606. Cables shall not be installed in the same cable tray, utility pole compartment, or floor trench compartment with ac power cables. Cables not installed in conduit or wireways shall be properly secured and neat in appearance and, if installed in plenums or other spaces used for environmental air, shall comply with NFPA 70 requirements for this type of installation. Conduit ends shall be reamed to eliminate sharp edges and terminate with an insulated bushing. The interior area of cable trays shall be free of burrs, sharp edges, or projections that can damage cable insulation. Do not exceed 50 percent fill in cable trays.

3.1.1 Horizontal Distribution Cable

The rated cable pulling tension shall not be exceeded. Cable shall not be stressed such that twisting, stretching or kinking occurs. Cable shall be continuous and uninterrupted and shall have no bridge taps, branches, splices, or "y" connections at any point. Cable shall not be spliced. Fiber optic cables shall be installed either in conduit or through type cable trays to prevent microbending losses. Copper cable not in a wireway shall be suspended a minimum of 200 mm above ceilings by cable supports no greater than 1.5 m apart. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items. Placement of cable parallel to power conductors shall be avoided, if possible; a minimum separation of 300 mm (12 inches) shall be maintained when such placement cannot be avoided. Maintain a minimum separation of 1,220mm (4 feet) from dry type transformers. Cables shall be terminated; no cable shall contain unterminated elements. Minimum bending radius shall not be exceeded during installation or once installed. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered. No single section of conduit shall be longer than 30.5m (100 feet) or contain more than two 90 degree bends between junction boxes or pull points. The inside radius of a bend in conduit shall be at least six times the internal diameter. A proper cable lubricant, approved by the DOIM, shall be applied at the manufacturer's recommended rate during the installation of the cable assemblies into conduits.

3.1.2 Riser and Backbone Cable

Vertical cable support intervals shall be in accordance with manufacturer's recommendations. Cable bend radius shall not be less than ten times the outside diameter of the cable during installation and once installed. Maximum tensile strength rating of the cable shall not be exceeded. Cable

shall not be spliced. All vertical cable runs in duct or on ladder shall be tied with plastic or metal straps or lacing twine at the top of the run and at least every 36 inches vertically to prevent cable strain. Strap types shall be of the proper width to avoid making kinks in the cables, and shall be approved by the DOIM.

3.1.3 Telecommunications Outlets

3.1.3.1 Faceplates

The faceplate shall have a built-in cover for label inserts. The information provided on each faceplate for each jack. The contractors layout and labeling plan shall be coordinated through the contracting Officer and Base Larry Davis Ph # 530 634-3226. Each jack shall be labeled as to its function and a unique number to identify cable link.

3.1.3.2 Cables

Unshielded twisted pair and fiber optic cables shall have a minimum of 150 mm of slack cable loosely coiled into the telecommunications outlet boxes. Minimum manufacturers bend radius for each type of cable shall not be exceeded.

3.1.3.3 Pull Cords

Pull cords shall be installed in all conduit serving telecommunications outlets which do not initially have fiber optic cable installed.

3.1.4 Terminal Blocks

Terminal blocks shall be mounted in orderly rows and columns. Adequate vertical and horizontal wire routing areas shall be provided between groups of blocks. Industry standard wire routing guides shall be utilized.

3.1.5 Unshielded Twisted Pair Patch Panels

Patch panels shall be mounted in equipment racks with sufficient modular jacks to accommodate the installed cable plant plus 10 percent spares. Cable guides shall be provided above, below, in the rear of patch panels for termination of horizontal cable plant and cross connection to wall mounted S110 blocks, and between each panel.

3.1.6 Fiber Optic Patch Panels

Patch panels shall be mounted in equipment racks with sufficient ports to accommodate the installed cable plant plus 10 percent spares. A slack loop of fiber shall be provided within each panel. Loop shall be 900 mm in length.. The outer jacket of each cable entering a patch panel shall be secured to the panel to prevent movement of the fibers within the panel, using clamps or brackets specifically manufactured for that purpose.

3.1.7 Equipment Cabinets And Racks

Equipment cabinets shall be bolted to the floor slab with anchor bolts. Cable guides shall be bolted or screwed to racks. Cabinet racks shall be installed level. Ganged Equipment cabinets shall be bolted together. Ganged Equipment cabinets shall have adjacent side panels removed. Wall mounted Cabinets and racks shall be secured to the mounting surface to prevent fully loaded racks from separating from the mounting surface.

3.1.8 Cabinet And Rack Mounted Equipment

Equipment to be rack mounted shall be securely fastened to racks by means of the manufacturer's recommended fasteners.

3.2 TERMINATION

Cables and conductors shall sweep into termination areas; cables and conductors shall not bend at right angles. Manufacturer's minimum bending radius shall not be exceeded. When there are multiple system type drops to individual workstations, relative position for each system shall be maintained on each system termination block or patch panel, and as recommended by Base Larry Davis, 9CS/SCXP Ph# 530 634-3226.

3.2.1 Unshielded Twisted Pair Cable

Each pair shall be terminated on appropriate outlets, terminal blocks or patch panels. No cable shall be unterminated or contain unterminated elements. Pairs shall remain twisted together to within the proper distance from the termination as specified in EIA ANSI/TIA/EIA-568-B.1 & B.2.

Unless directed otherwise, the amount of untwisting shall not exceed 0.5 inches for Category 5e cables. Remove only as much cable jacket as is required for termination and trimming. Conductors shall not be damaged when removing insulation and trimming. Wire insulation shall not be damaged when removing outer jacket.

3.2.2 Cable Television Coaxial Cable

Home run type station cables shall be terminated at the outlet only.

3.2.3 Fiber Optic Cable

Each fiber shall have connectors installed. The pull strength between the connector and the attached fiber shall be not less than 11.3 kg. The mated pair loss, without rotational optimization, shall not exceed 1.0 dB. Fiber optic connectors shall be installed per EIA ANSI/TIA/EIA-568-B.1 & B.2.

3.3 GROUNDING

Signal distribution system ground shall be installed in the telecommunications entrance facility and in each telecommunications closet in accordance with EIA ANSI/TIA/EIA-607 and Section 16415 ELECTRICAL WORK, INTERIOR, and/or as indicated on the drawings. All racks, equipment cabinets, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the equipment room shall be grounded to the respective main ground buss using a minimum #6 AWG stranded copper bonding conductor and compression connectors. Where metallic panels attached to the rack do not have sufficient metal to metal contact to provide an adequate path to ground, they shall be bonded to the rack using a minimum #14 AWG copper conductor. The copper conductor size shall be upgraded based on the largest power conductor feeding any rack mounted equipment. The conductor shall be continuous, attaching all isolated components in a daisy chain fashion from top to bottom and bonded to the rack using an appropriate compression connector.

3.4 ADDITIONAL MATERIALS

The Contractor shall provide the following additional materials required for facility startup.

- a. 10 of each type outlet.
- b. 10 of each type cover plate.
- c. 1 of each type terminal block for each telecommunications closet.
- d. 4 Patch cords of 3 m for each telecommunications closet.
- e. 1 Set of any and all special tools required to establish a cross connect and to change and/or maintain a terminal block.

3.5 ADMINISTRATION AND LABELING

3.5.1 Labeling

3.5.1.1 Labels

All labels shall be in accordance with EIA ANSI/TIA/EIA-606. All label printing will be machine generated using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet labels will be the manufacturer's labels provided with the outlet assembly.

3.5.1.2 Cable

All cables will be labeled using color labels on both ends with encoded identifiers per EIA ANSI/TIA/EIA-606 and the labeling plan provided by the government communications point of contact.

3.5.1.3 Termination Hardware

All wall, and floor workstation outlets, wall mounted s110 blocks, UTP, cable television coaxial cable, fiber optic and patch panel connections will be labeled using color coded labels with encoded identifiers per EIA ANSI/TIA/EIA-606.

3.6 TESTING

Materials and documentation to be furnished under this specification are subject to inspections and tests. All components shall be terminated prior to testing. Equipment and systems will not be accepted until the required inspections and tests have been made, demonstrating that the signal distribution system conforms to the specified requirements, and that the required equipment, systems, and documentation have been provided. Notification of any planned testing shall be given to the Contracting Officer at least 14 days prior to any tests. The tests shall be performed in the presence of and/or verified by Government Quality Assurance Personnel or the Contracting Officer. Any discrepancies noted during testing shall be corrected, and those tests rerun, within 14 days. Contractual acceptance testing shall begin no later than two weeks prior to cutover. The cabling system shall be installed to provide color coding, labeling, and documentation in compliance with Sp-4655, TIA/EIA-606, IEEE 802.3ae and the labeling plan provided by the Government communications

point of contact.

3.6.1 Test Plan

The test plan shall define milestones for each test, equipment, personnel, facilities, and supplies required. The test plan shall include the detailed test procedures to be completed, cross referenced to the specific contractual requirements, stated herein and in the drawings. The plan shall also include steps for verification of station records and cable locations for all stations. All test results data shall be uploaded to a PC and printed out. An electronic file and a hard copy of all Test results shall be provided to the Contracting Officer.

3.6.2 Test Documentation

Test documentation shall be provided in a three ring binder(s) within three weeks after the completion of the telecommunications system. The binder(s) shall be clearly marked on the outside front cover and spine with the words "Test Results", the project name, and the date of completion (month and year). The binder shall be divided by major heading tabs, Horizontal and Backbone. Each major heading shall be further sectioned by test type. Within the horizontal and backbone sections, scanner test results (Category 5e), fiber optic attenuation test results, OTDR traces, and green light test results shall be segregated by tab. Test data within each section shall be presented in the sequence listed in the administration records. The test equipment by name, manufacturer, model number and last calibration date will also be provided at the end of the document. Unless a more frequent calibration cycle is specified by the manufacturer, an annual calibration cycle is required on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test.

Scanner tests shall be printed on 8-1/2" x 11" paper. Hand written test results (attenuation results and green light results) shall be documented on the test form. OTDR test results shall be printed or attached and copied on 8-1/2" x 11" paper for inclusion in the test documentation binder.

When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be collocated in the binder.

All test form sheets shall be furnished by the telecommunications manufacturer and shall include as a minimum: a. Cable ID. _____
 Location: _ _ _ _ Point of Origination: _____
 b. Company: _____ Person Conducting Test & Factory Certification No.: _____
 c. Comments: _____ Govt. COR: _____
 d. Type of Test: _ _ _ _ Tested Date & Time: _____
 e. Test Result: _____
 f. Name, model and serial number of the test equipment: _ _ _ _
 g. Calibration date of test equipment: _____

3.6.3 Test Equipment

The contractor shall supply and maintain the necessary test equipment to accomplish the following tests. For Category 5e, all test equipment shall meet or exceed the standards, specifications and parameters as stated in this document and the latest revision of TIA SP-4195 or, on publication, ANSI/TIA/EIA-568-B.1 & B.2 and, for Category 5 cables, only TIA/EIA TSB 67.

The Contractor shall maintain current calibration of all test equipment during the entire testing period. Calibration shall be accomplished according to the manufacturer's specifications. Provide field testers, as recommended by the latest revision of TIA SP-4195 or, on publication, ANSI/TIA/EIA-568-B.1 & B.2. The field tester manufacturer shall make available to the Contracting Officer a simple procedure for verifying, reporting, and recording the consistency of the field tester in the field. Field testers shall be capable of reporting data at all measured points and uploading the data to a PC and printer.

3.6.4 Unshielded Twisted Pair Tests

All unshielded metallic cable pairs shall be tested for proper identification, correct pin configuration, continuity, and integrity. Testing shall be bi-directional and include, as a minimum, four test parameters for Category 5e (enhanced) cable which are Wire Map, Length, Attenuation, NEXT (Near-end Crosstalk) loss, Power Sum NEXT, Return Loss, ACR, Power Sum ACR, ELFEXT, Power Sum ELFEXT, Prop Delay, and Delay Skew. A Pass or Fail on a parameter shall be determined by the allowable limits for that parameter, as described by TIA/EIA TSB 67 for Category 5e as described by the latest revision of TIA SP-4195 or, on publication, ANSI/TIA/EIA-568-B.1 & B.2. All opens, shorts, crosses, grounds, and reversals shall be corrected. Correct color coding and termination of each pair shall be verified in the communications closet and at the outlet. Horizontal wiring shall be tested from and including the termination device in the communications closet to and including the modular jack in each room. Backbone wiring shall be tested end-to-end, including termination devices, from terminal block to terminal block, in the respective communications closets. Each installed cable shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the TIA/EIA-568-B.1 & B.2 & B.3 Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multipair cables, the longest pair length shall be recorded as the length for the cable. These tests shall be completed and all errors corrected as required by the TIA/EIA TSB 67 for Category 5e as described by the latest revision of TIA SP-4195 or, on publication, ANSI/TIA/EIA-568-B.1, B.2, B.3 standard.

3.6.5 Category 5e Circuits

All category 5e circuitscable runs shall be tested in accordance with the latest revision of TIA SP-4195, ANSI/TIA/EIA-568-B.1 & B.2 for Category 5e, and in accordance with TIA/EIA TSB 67. Testing shall be done using the TIA SP-4195 and TSB 67 basic link test and channel tests procedures for level II testing. Testing equipment used shall meet the level II accuracy requirements of TIA SP-4195 and TSB 67. The tests shall be accomplished between each outlet jack and the associated telecommunications closet/telephone backboard. Cables which contain failed circuits shall be replaced and retested until they pass specified tests. There shall not be any defective pairs in the final installation of the telecommunications cabling. Testing shall be performed with both ends terminated per the appropriate section of the latest revision TIA SP-4195, ANSI/TIA/EIA-568-B.1 & B.2, and per section 4 of TIA/EIA TSB 67. Test results shall be printed directly from the test unit or from a download file using an application from the test equipment manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test achieved. Cables which contain failed circuits

shall be replaced and retested to verify the standard is met.

3.6.6 Cable Television Coaxial Cable

Cable shall be tested for continuity, shorts and opens. Characteristic impedance shall be verified over the range of intended operation. Cable length shall be verified. Cable shall be sweep tested for attenuation over the range of intended operation.

3.6.7 AS-BUILT DRAWINGS

The installation contractor will be provided with 2 sets of D-size drawings at the start of the project. One set will be designated for as the central location to document all as-built information as it occurs throughout the project. The central set shall be maintained by the Contractor on a daily basis, and will be available to the Contracting Officer upon request during the course of the project. Anticipated variations from the design drawings may be for such things as cable routing and actual outlet placement. No variations shall be allowed to the planned termination positions of horizontal and backbone cables, and grounding conductors unless approved in writing by the Contracting Officer.

The Contractor shall provide the central drawing set to the Contracting Officer at the conclusion of the project. The marked up drawing set shall accurately depict the as-built status of the telecommunications system including termination locations, cable routing, and all administration labeling for the telecommunications outlet and cabling system. In addition, a narrative shall be provided that describes any areas of difficulty encountered during the installation that could potentially cause problems to the telecommunications system.

3.6.8 Warranty and Services

The contractor shall provide a system warranty covering the installed cabling system against defects in workmanship, components, and performance, and follow-on support after project completion.

3.6.9 Installation Warranty

The contractor shall warrant the cabling system against defects in workmanship for a period of one year from the date of system acceptance. The warranty shall cover all labor and materials necessary to correct a failed portion of the system and to demonstrate performance within the original installation specifications after repairs are accomplished. This warranty shall be provided at no additional cost to the Owner.

3.6.10 Cabling System Warranty

The contractor shall facilitate a 15-year performance warranty between the manufacturer and the Owner. An extended component warranty shall be provided which warrants functionality of all components used in the system for 15 years from the date of acceptance. The performance warranty shall warrant both the installed backbone and 100 MHz horizontal copper, and both the horizontal and the backbone optical fiber portions of the cabling system. Copper and fiber optic links shall be warranted against the link and segment performance minimum expected results as defined in section 3.6 TESTING, above.

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16711

TELEPHONE SYSTEM, OUTSIDE PLANT

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
- 1.3 QUALIFICATIONS
 - 1.3.1 Cable Installers
 - 1.3.2 Cable Splicing and Termination
 - 1.3.3 Manufacturers
- 1.4 SUBMITTALS
- 1.5 DELIVERY AND STORAGE
 - 1.5.1 Cable Requirements-
 - 1.5.2 Equipment

PART 2 PRODUCTS

- 2.1 STANDARD PRODUCTS
- 2.2 CABLE
 - 2.2.1 Copper Conductor Cable
 - 2.2.1.1 Underground
 - 2.2.2 Fiber Optic Cable
 - 2.2.2.1 Cable Cores
 - 2.2.2.2 Optical Fiber
 - 2.2.2.3 Performance Requirements
- 2.3 CLOSURES
 - 2.3.1 Copper Conductor Closures
 - 2.3.1.1 Buried Closure
 - 2.3.1.2 Underground Closure
 - 2.3.2 Fiber Optic Closures
 - 2.3.2.1 Fiber Optic Buried
 - 2.3.2.2 Fiber Optic Underground
- 2.4 CABLE SPLICES AND ORGANIZERS
 - 2.4.1 Copper Cable Splices
 - 2.4.2 Fiber Optic Cable Splices
 - 2.4.3 Fiber Optic Splice Organizer
- 2.5 CABLE TERMINALS
 - 2.5.1 Pedestal-Type Cable Terminals
 - 2.5.2 Cross-connect Cable Terminals
- 2.6 MANHOLE AND DUCT
 - 2.6.1 New Manholes
 - 2.6.2 Manhole Overbuilds
 - 2.6.3 Duct/Conduit
 - 2.6.4 Innerduct
- 2.7 EQUIPMENT RACKS
 - 2.7.1 Cable Guides
 - 2.7.2 Floor Mounted Cabinets
 - 2.7.3 Wall Mounted Cabinets

- 2.7.4 Cable TV Cabinets
- 2.7.5 Equipment Mounting Backboard
- 2.8 CONNECTOR BLOCKS
- 2.9 PROTECTOR MODULES
- 2.10 FIBER-OPTIC TERMINATIONS
 - 2.10.1 Fiber Optic Connectors
 - 2.10.2 Fiber Optic Patch Panels
- 2.11 MISCELLANEOUS ITEMS
 - 2.11.1 Shield Connectors
 - 2.11.2 Grounding Braid
 - 2.11.3 Warning Tape
 - 2.11.4 Cable Warning Signs

PART 3 EXECUTION

- 3.1 INSTALLATION
 - 3.1.1 Cable Inspection and Repair
 - 3.1.2 Buried Cable
 - 3.1.2.1 Cable Depth
 - 3.1.2.2 Above Ground Cable Protection
 - 3.1.2.3 Telephone Cable Bends
 - 3.1.2.4 Penetrations
 - 3.1.2.5 Cable Protection
 - 3.1.2.6 Backfill for Rocky Soil
 - 3.1.3 Underground Cable
 - 3.1.3.1 Cable Pulling
 - 3.1.3.2 Penetrations for Cable Access
 - 3.1.3.3 Cable Bends
 - 3.1.4 Manhole and Ducts
 - 3.1.4.1 Innerduct Installation
 - 3.1.4.2 Pull Cord
 - 3.1.5 Surge Protection
- 3.2 SPLICING
 - 3.2.1 Copper Conductor Splices
 - 3.2.2 Fiber Optic Splices
- 3.3 GROUNDING
 - 3.3.1 Ground Bars
 - 3.3.1.1 Telecommunications Master Ground Bar (TMGB)
 - 3.3.1.2 Telecommunications Ground Bar (TGB)
 - 3.3.2 Incoming Outside Plant Cables
 - 3.3.3 Cable Stubs
 - 3.3.4 Shields
 - 3.3.5 Protection Assemblies
 - 3.3.6 Manholes
- 3.4 CUTOVER AND RECORDS
- 3.5 ACCEPTANCE TESTS
 - 3.5.1 Copper Conductor Cable
 - 3.5.2 Fiber Optic Cable
 - 3.5.2.1 OTDR Test
 - 3.5.2.2 Attenuation Test
 - 3.5.2.3 Bandwidth Test

-- End of Section Table of Contents --

SECTION 16711

TELEPHONE SYSTEM, OUTSIDE PLANT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C62.61 (1993) Gas Tube Surge Arrestors on Wire Line Telephone Circuits

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2239 (1996a) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA ANSI/EIA 455-81A-91 (1992) FOTP-81 Compound Flow (Drip) Test for Filled Fiber Optic Cable

EIA ANSI/EIA/TIA-455-30B (1991) FOTP-30 Frequency Domain Measurement of Multimode Optical Fiber Information Transmission Capacity

EIA ANSI/EIA/TIA-455-53A (1990) FOTP-53 Attenuation by Substitution Measurement for Multimode Graded-Index Optical Fibers or Fiber Assemblies Used in Long Length Communications Systems

EIA ANSI/EIA/TIA-455-78A-98 (1990; R 1998) FOTP-78 Spectual Attenuation Cutback Measurement for Single Mode Optical Fibers

EIA ANSI/TIA/EIA-568-B.1, B.2, B.3A (2001) Commercial Building Telecommunications Cabling Standard

EIA ANSI/TIA/EIA-568-B.1 (2001) Testing requirements standards

EIA ANSI/TIA/EIA-568-B.2 (2001) Cabling system requirements.

EIA ANSI/TIA/EIA-568-B.3 (2001) Optical fiber cabling system standards

I3A (2000) Technical guide for installation information infrastructure architecture

I3A implementation version 3.

EIA ANSI/TIA/EIA-607

(2001) Commercial Building Grounding and Bonding Requirements for Telecommunications

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2

(1997) National Electrical Safety Code

IEEE 802.3ae

(2001) Fiber cabling objectives.

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-85-625

(1996) Airecore, Polyolefin Insulated, Copper Conductor Telecommunications Cable

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70

(1999) National Electrical Code

RURAL UTILITIES SERVICE (RUS)

REA Bulletin 345-39

(1985) Telephone Station Protectors

REA Bulletin 345-50

(1979) Trunk Carrier Systems (PE-60)

REA Bulletin 345-65

(1985) Shield Bonding Connectors (PE-33)

REA Bulletin 345-72

(1985) Filled Splice Closures (PE-74)

REA Bulletin 345-151

(1989) Conduit and Manhole Construction, REA Form 515c

REA Bulletin 1753F-205 (PE-39)

(1993) Filled Telephone Cables

REA Bulletin 1753F-207 (PE-87)

(1994) Terminating Cables

REA Bulletin 1753F-208

(1993) Filled Telephone Cables with Expanded Insulation (PE-89)

RUS Bulletin 1751F-635

(1996) Aerial Plant Construction

RUS Bulletin 1751F-643

(1998) Underground Plant Design

RUS Bulletin 1753F-302 (PE-91)

(1994) Outside Plant Housings and Serving Area Interface Systems

RUS Bulletin 1753F-401(PC-2)

(1995) Splicing Copper and Fiber Optic Cables

RUS REA Bulletin 1751F-641

(1995) Construction of Buried Plant

RUS REA Bull 1753F-201 (PC-4)

(1997) Acceptance Tests and Measurements of Outside Plant

RUS REA Bull 1753F-601 (PE-90)

(1994) Filled Fiber Optic Cables

RUS REA Bulletin 1755I-100

(1999) List of Materials Acceptable for Use on Telecommunications Systems of RUS

Borrowers

UNDERWRITERS LABORATORIES (UL)

- UL 50 (1995; Rev thru Oct 1997) Enclosures for Electrical Equipment
- UL 497 (1995; Rev Mar 1996) Protectors for Paired Conductor Communication Circuits

1.2 SYSTEM DESCRIPTION

The outside plant system shall consist of all cable, conduit, manholes, poles, etc. required to provide signal paths from the closest point of presence to the new facility, including free standing frames or backboards, terminating cables, lightning and surge protection modules at the entry facility. The work consists of furnishing, installing, testing and making operational a complete outside plant system for continuous use.

1.3 QUALIFICATIONS

1.3.1 Cable Installers

Installation shall be under the direct supervision of an individual with a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components.

1.3.2 Cable Splicing and Termination

All cable splicers shall have training in the proper techniques and have a minimum of 3 years experience in splicing and terminating the specified cables. Modular splices shall be performed by factory certified personnel or under direct supervision of factory trained personnel for products used.

1.3.3 Manufacturers

The cable, equipment, and hardware provided shall be from manufacturers that have a minimum of 3 years experience in producing the types of cable, equipment, and hardware specified.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Spare Parts and Equipment List; FIO.

A data list of recommended spare parts, tools, and test equipment for each different item of material and equipment specified prior to beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Telephone System; FIO.

Detail drawings, consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, performance charts and curves, and catalog cuts. Detail drawings shall also contain complete configuration information, wiring diagrams and any other details required to demonstrate that the cable system has been coordinated to support the transmission systems identified in the specifications and drawings. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operations.

Record Drawings; FIO.

Record drawings for the installed wiring system showing the actual location of all cable terminations, splices, routing, and size and type of all cables. The identifier for each termination and cable shall appear on the drawings. The drawings shall include gauge and pair or fiber count for each cable, duct and innerduct arrangement, or conductor assignment of outside plant, and protector and connector block layout at the termination points after installation.

SD-06 Instructions

Installation; FIO.

Printed copies of the manufacturer's recommendations for the material being installed, prior to installation. Installation of the item will not be allowed to proceed where installation procedures, or any part thereof, are required to be in accordance with those recommendations until the recommendations are received and approved.

SD-08 Statements

Acceptance Tests; FIO.

Test plans defining all tests required to ensure that the system meets specified requirements. The test plans shall define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans shall identify the capabilities and functions to be tested.

Cutover and Records; FIO.

The cutover plan shall provide procedures and schedules for relocation of facility station numbers without interrupting service to any active location.

SD-09 Reports

Acceptance Tests; FIO.

Test reports in booklet form showing all field tests performed, upon completion and testing of the installed system. Measurements shall be tabulated on a pair by pair or strand by strand basis.

SD-13 Certificates

Telephone System; FIO.

Proof that the items furnished under this section conform to the specified requirements in FCC, ICEA, REA, RUS, ANSI, ASTM, NFPA, EIA, or UL, where

materials and equipment are so specified.

Qualifications; FIO.

The qualifications of the manufacturer, splicer, and installation supervisor as specified.

1.5 DELIVERY AND STORAGE

1.5.1 Cable Requirements-

All cable shall be shipped on reels. The diameter of the drum shall be large enough to prevent damage to the cable during reeling and unreeling. The reels shall be constructed to prevent damage during shipment and handling. The outer end of the cable shall be securely fastened to the reel head to prevent the cable from becoming loose in transit. The inner end of the cable shall project into a slot in the side of the reel, or into a housing on the inner slot of the drum, with sufficient length to make it available for testing. The inner end shall be fastened to prevent the cable from becoming loose during installation. End seals shall be applied to each of the cables to prevent moisture from entering the cable. The reels with cable shall be suitable for outside storage conditions when the temperature ranges from minus 40 to plus 65 degrees C, with relative humidity from 0 to 100 percent.

1.5.2 Equipment

All equipment shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants, in accordance with the manufacturer's requirements.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall be the manufacturer's latest standard design that has been in satisfactory use for at least 2 years prior to bid opening. Each major component of equipment shall have the manufacturer's name and type identified on the equipment. All products supplied shall be specifically designed and manufactured for use with outside plant communications systems. All items of the same class of equipment shall be the products of a single manufacturer.

2.2 CABLE

2.2.1 Copper Conductor Cable

Copper conductor cable shall conform to the following:

2.2.1.1 Underground

Cable shall be manufactured per REA Bulletin 1753F-205 (PE-39) or REA Bulletin 1753F-208. A 0.2 mm coated aluminum or 0.12 mm copper metallic shield shall be provided.

2.2.2 Fiber Optic Cable

Fiber optic cable shall be specifically designed for outside use with tight

or loose buffer construction. The tight buffer optical fiber cable shall consist of a central glass optical fiber surrounded by a soft intermediate buffer to allow for thermal expansions and proper fitting of the secondary buffer. The loose buffer optical fiber cable shall have the glass optical fiber within a filled loose tube. All fiber optic cables used shall conform to the requirements of RUS REA Bull 1753F-601 (PE-90) including any special requirements made necessary by a specialized design. The fiber shall have no factory splices. Meeting EIA ANSI/TIA/EIA-568-B.1 & B.3.

2.2.2.1 Cable Cores

A central, nonmetallic core member shall be included to serve as a cable core foundation to reduce strain on the fibers, but not to serve as a pulling strength member.

2.2.2.2 Optical Fiber

Single-mode optical fibers shall be Class IV.

2.2.2.3 Performance Requirements

The fiber optic cable shall comply with the specified mechanical performance requirements while used in buried and underground duct applications where the temperature varies from minus 20 to plus 60 degrees C. Optical performance degradation shall be less than 5 percent of the optical performance requirements in the temperature range of minus 20 to plus 60 degrees C. The fiber optic cable shall not be damaged in storage where the temperature may vary from minus 40 to plus 65 degrees C.

2.3 CLOSURES

2.3.1 Copper Conductor Closures

2.3.1.1 Buried Closure

Buried closure shall conform to REA Bulletin 345-72.

2.3.1.2 Underground Closure

Underground closures shall conform to REA Bulletin 345-72. The closure shall be of thermoplastic, thermoset, or stainless steel material and be suitable for use in a vault or manhole.

2.3.2 Fiber Optic Closures

2.3.2.1 Fiber Optic Buried

The buried closure shall be suitable for enclosing a splice organizer in a container into which can be poured an encapsulating compound. The closure shall protect the splice and be suitable for use in the buried environment. The encapsulating compound shall be re-enterable and shall not alter the chemical stability of the closure.

2.3.2.2 Fiber Optic Underground

The underground closure shall be suitable to house a splice organizer in a protective housing. An encapsulating compound shall be poured into this enclosure. The closure shall be of thermo-plastic, thermoset-plastic, or stainless steel material and suitable for use in a vault or manhole. The

encapsulating compound shall be re-enterable and shall not alter the chemical stability of the closure.

2.4 CABLE SPLICES AND ORGANIZERS

2.4.1 Copper Cable Splices

All cables greater than 25 pairs shall be spliced using modular splicing connectors, which accommodate 25 pairs of conductors at a time. The correct connector size shall be used to accommodate the wire gauge of the cable to be spliced. The connectors used shall be listed in RUS REA Bulletin 1755I-100.

2.4.2 Fiber Optic Cable Splices

Each fiber optic splice shall be physically protected by a splice kit. The kit shall be specially designed for the splice. Fiber optic splices shall be of the fusion type.

2.4.3 Fiber Optic Splice Organizer

The splice organizer shall be suitable for housing fiber optic splices in a neat and orderly fashion. The splice organizer shall allow for a minimum of 1 m of fiber for each fiber within the cable to be neatly stored without kinks or twists. The splice organizer shall accommodate individual strain relief for each splice. The splice organizer shall allow for future maintenance or modification, without damage to the cable or splices. All required splice organizer hardware, such as splice trays, protective glass shelves, and shield bond connectors shall be provided in the organizer kit.

2.5 CABLE TERMINALS

2.5.1 Pedestal-Type Cable Terminals

Pedestal-type cable terminals shall conform to RUS Bulletin 1753F-302 (PE-91).

2.5.2 Cross-connect Cable Terminals

Cross-connect cable terminals shall be weatherproofed for outdoor use and suitable for pole, pad, or stake mounting. The terminal shall be equipped with mounting columns and distribution rings for jumper-wire routing. The terminal shall be of aluminum or steel construction and ribbed for strength.

2.6 MANHOLE AND DUCT

All manhole and duct products shall conform to RUS Bulletin 1751F-643.

2.6.1 New Manholes

New manholes shall be equipped with pulling-in irons, cable racks, and ground rod, and conform to the requirements of REA Bulletin 345-151. Manholes shall be a minimum of 3.7 m long by 1.83 m wide by 2.10 m high (inside dimensions) or as indicated. Manholes shall be designed so that the main trunk conduits enter and exit near the center of the ends, and lateral conduits exit on the sides near the corners. Manholes may be pre-cast or cast in place.

2.6.2 Manhole Overbuilds

Existing manholes which are enlarged as part of this project shall be equipped with new pulling-in irons, cable racks, and ground rod.

2.6.3 Duct/Conduit

Conduit shall be furnished as specified in Sections 16415 ELECTRICAL WORK, INTERIOR and 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND and as shown on project drawings.

2.6.4 Innerduct

Innerduct shall be SIDR 11.5 polyethylene plastic pipe conforming to ASTM D 2239.

2.7 EQUIPMENT RACKS

Distribution frames, cabinets, and back-boards shall be provided as shown and designed to mount connector blocks, protector blocks, cross connects, and other hardware required to terminate and protect the outside telephone plant cable; to provide a demarcation point between inside and outside plant cable; and to allow inside and outside plant cable to be cross connected. meeting EIA ANSI/TIA/EIA-568-B.1 & B.3

2.7.1 Cable Guides

Cable guides shall be specifically manufactured for the purpose of routing cables, wires and patch cords horizontally and vertically on 480 mm equipment racks. Cable guides shall consist of ring or bracket-like devices mounted on rack panels for horizontal use or individually mounted for vertical use. Cable guides shall mount to racks by screws and/or nuts and lock-washers.

2.7.2 Floor Mounted Cabinets

Floor mounted cabinets shall be as specified in section 16710, Premises Distribution System.

2.7.3 Wall Mounted Cabinets

Wall mounted cabinets shall be as specified in section 16710, Premises Distribution System.

2.7.4 Cable TV Cabinets

Wall mounted cabinets shall conform to UL 50 and have boxes constructed of zinc-coated sheet steel with dimensions not less than shown on drawings. Trim shall be fitted with hinged door and flush catch. Doors shall provide maximum openings to the box interiors. Boxes shall be provided with 19 mm plywood backboard painted white or a light color. A duplex AC outlet shall be installed within the cabinet, provided on the branch circuit feeding the Communications Room..

2.7.5 Equipment Mounting Backboard

Backboards shall be 19 mm AC plywood, sized as shown, painted with white or light colored paint.

2.8 CONNECTOR BLOCKS

Connector blocks consisting of flame-retardant molded plastic fastened to a metal mounting bar shall be provided to terminate the outside plant cable as shown. The connector blocks shall be of 100-pair block size and equipped with protection modules. The connector blocks shall be 24 gauge stub type. The cable stubs shall be 100 pair and conform to REA Bulletin 1753F-207 (PE-87).

2.9 PROTECTOR MODULES

The protector modules shall be of the two-element gas tube type. Protection modules shall be heavy duty, $A > 10$ kA, $B > 400$, $C > 65A$ where A is the maximum single impulse discharge current, B is the impulse life and C is the AC discharge current per ANSI C62.61. The gas modules shall shunt high voltage to ground, fail short, be equipped with an external spark gap and heat coils, and shall comply with UL 497.

2.10 FIBER-OPTIC TERMINATIONS

2.10.1 Fiber Optic Connectors

All outside plant fiber strands shall be terminated in a SC type fiber optic connector, with ceramic ferrule material and a maximum insertion loss of 0.5 dB. Connectors shall meet performance standards of EIA ANSI/TIA/EIA-568-B.1 & B.3 and IEEE 802.3aeA. If pre-connectorized cable assemblies are used, the connectors shall be terminated on a 3 m length of single-fiber cable. Pigtails shall not be used. The single-fiber cable shall contain a buffered optical fiber of the same type and specification as that used in the multi-fiber cable.

2.10.2 Fiber Optic Patch Panels

Patch panels shall be a complete system of components by a single manufacturer, and shall provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection. Patch panels shall be 480 mm wall cabinet mounted panels. Patch panels shall provide strain relief for cables. Panels shall be provided with engraved laminated plastic nameplates above each connector. Patch panel connectors and couplers shall be the same type and configuration as used elsewhere in the system. Meeting EIA ANSI/TIA/EIA-568-B.1 & B.3

2.11 MISCELLANEOUS ITEMS

2.11.1 Shield Connectors

Shield connectors shall make a stable, low-impedance electrical connection between the shield of the communications cable and a conductor such as a strap, bar, or wire. The connector shall be made of tin-plated tempered brass. Shield bond connectors shall comply with REA Bulletin 345-65. Meeting EIA ANSI/TIA/EIA-568-B.1 & B.3

2.11.2 Grounding Braid

Grounding braid shall provide low electrical impedance connections for dependable shield bonding. The braid shall be made from flat tin-plated copper.

2.11.3 Warning Tape

Marking and locating tape shall be acid and alkali resistant polyethylene film, 150 mm wide with a minimum strength of 12.1 MPa lengthwise and 10.3 MPa crosswise. The tape shall be manufactured with integral wires, foil backing, or other means to enable detection by a metal detector when the tape is buried up to 1 m deep. The metallic core shall be encased in a protective jacket or provided with other means to protect it from corrosion and shall be specifically manufactured for marking and locating underground utilities. The warning tape shall be orange in color and continuously imprinted with the words "WARNING - COMMUNICATIONS CABLE BELOW" at not more than 1.2 m intervals.

2.11.4 Cable Warning Signs

Cable warning signs, which identify the route of buried cable, shall be stake mounted. The stake shall be driven into undisturbed soil and the sign shall be mounted to the stake in accordance with the manufacturer's instructions. Warning signs shall be placed at intervals of no more than 152.5 m and at each change of direction in the cable route. Warning signs shall also be placed on each side of every crossing of surface obstacles such as roads, railroads, stream crossings, or any similar crossing where excavation is likely to occur.

PART 3 EXECUTION

3.1 INSTALLATION

All system components and appurtenances shall be installed in accordance with the manufacturer's instructions and as shown. All installation work shall be done in accordance with the safety requirements set forth in the general requirements of EIA ANSI/TIA/EIA-568-B.1 & B.3, IEEE C2 and NFPA 70.

3.1.1 Cable Inspection and Repair

All cable and wire used in the construction of the project shall be handled with care. Each reel shall be inspected for cuts, nicks or other damage. All damage shall be repaired to the satisfaction of the Contracting Officer. The reel wrap shall remain intact on the reel until the cable or wire is ready to be placed. Meeting EIA ANSI/TIA/EIA-568-B.1 & B.3

3.1.2 Buried Cable

Buried cable installation shall be accomplished in accordance with RUS REA Bulletin 1751F-641.

3.1.2.1 Cable Depth

Cables placed in soil shall be at a minimum depth of 610 mm. Cables placed at ditch crossings shall be at a minimum depth of 915 mm. A warning tape shall be placed above the cable and approximately 450 mm below ground level. Cables placed in rock shall be at a minimum depth of 150 mm.

3.1.2.2 Above Ground Cable Protection

Cable installed on the outside of buildings, less than 2.5 m above finished grade, shall be protected against physical damage.

3.1.2.3 Telephone Cable Bends

Telephone cable bends shall have a radius of not less than 10 times the cable diameter.

3.1.2.4 Penetrations

Penetrations in walls, ceilings or other parts of the building, made to provide for cable access, shall be caulked and sealed. Where conduits and ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials as specified in Section 07840 FIRESTOPPING. Fire stopped penetrations shall not compromise the fire rating of the walls or floors. All underground building entries shall be through waterproof facilities.

3.1.2.5 Cable Protection

Unless otherwise shown or specified, direct buried cable shall be protected in accordance with Table 300.5 of NFPA 70. Where additional protection is required, cable may be placed in galvanized iron pipe (GIP) sized on a maximum fill of 40% of cross-sectional area, or in concrete encased 100 mm PVC pipe. Conduits shall extend at least 150 mm per 305 mm burial depth beyond the edge of the surface where cable protection is required; all conduits shall be sealed on each end. Conduit may be installed by jacking or trenching. Trenches shall be backfilled with earth and mechanically tamped at 150 mm lifts so that the earth is restored to the same density, grade and vegetation as adjacent undisturbed material.

3.1.2.6 Backfill for Rocky Soil

When placing cable in a trench in rocky soil, the cable shall be cushioned by a fill of sand or selected soil at least 50 mm thick on the floor of the trench before placing the cable or wire. The backfill for at least 100 mm above the wire or cable shall be free from stones, rocks, or other hard or sharp materials which might damage the cable or wire. If the buried cable is placed less than 600 mm in depth, a protective cover of concrete shall be used.

3.1.3 Underground Cable

Underground cable installation shall be accomplished in accordance with the requirements set forth in RUS REA Bulletin 1751F-641. Meeting EIA ANSI/TIA/EIA-568-B.1 & B.3

3.1.3.1 Cable Pulling

For cable installed in ducts and conduit, a cable feeder guide shall be used, between the cable reel and the face of the duct and conduit, to protect the cable and guide it into the duct and conduit as it is paid off the reel. As the cable is paid off the reel, it shall be inspected for jacket defects. Precautions shall be taken during installation to prevent the cable from being kinked or crushed. A pulling eye shall be attached to the cable and used to pull the cable through the duct and conduit system. Cable shall be hand fed and guided through each manhole. As the cable is paid off the reel into the cable feeder guide, it shall be sufficiently lubricated with a type of lubricant recommended by the cable manufacturer. Where the cable is pulled through a manhole, additional lubricant shall be applied at all intermediate manholes. Dynamometers or load-tension instruments shall be used to ensure that the pulling line tension does not exceed the installation tension value specified by the cable manufacturer. The mechanical stress placed upon a cable during installation shall not

cause the cable to be twisted or stretched. Meeting EIA ANSI/TIA/EIA-568-B.1 & B.3

3.1.3.2 Penetrations for Cable Access

Penetrations in walls, ceilings or other parts of the building, made to provide for cable access, shall be caulked and sealed. Where conduits and ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials as specified in section 07840 FIRE STOPPING. Fire stopped penetrations shall not compromise the fire rating of the walls or floors. All underground building entries shall be through waterproof facilities.

3.1.3.3 Cable Bends

Telephone cable bends shall have a radius of not less than 10 times the cable diameter. Only large radius sweeps shall be used in conduit runs and shall not exceed a cumulative 90 degrees between manholes.

3.1.4 Manhole and Ducts

Manhole and duct systems shall be installed in accordance with Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND. Manholes shall be placed in line with the main duct. Splice cases shall be mounted in the center on the long sides. Lateral conduits shall exit the long sides near the corners.

3.1.4.1 Innerduct Installation

Innerduct shall be pulled through existing duct-manhole system in continuous sections. Splices, joints, couplings, or connections of any type will not be allowed between manholes. Innerduct shall be plugged at both ends with polyurethane foam duct seal; this material shall also be inserted between the innerduct and the duct if cables are placed in the innerducts. Only one cable shall be installed in a given innerduct. Existing and new unoccupied innerducts shall be trimmed leaving 50 mm exposed.

3.1.4.2 Pull Cord

Pull cords of 10 mm polypropylene shall be installed in all unused ducts and inner-ducts with a minimum of 610 mm spare cord protruding from each end.

3.1.5 Surge Protection

Except for fiber optic cable, all cables and conductors, which serve as communication lines, shall have surge protection meeting the requirements of REA Bulletin 345-50 installed at the entry facility. Meeting EIA ANSI/TIA/EIA-568-B.1 & B.3

3.2 SPLICING

3.2.1 Copper Conductor Splices

Copper conductor cable splicing shall be accomplished in accordance with RUS Bulletin 1753F-401(PC-2). Modular splicing shall be used on all cables larger than 25 pairs. Meeting EIA ANSI/TIA/EIA-568-B.1, B.2 and B.3

3.2.2 Fiber Optic Splices

Fiber optic splicing shall be in accordance with the manufacturer's recommendation; each splice shall have a loss of less than 0.1 dB. Meeting EIA ANSI/TIA/EIA-568-B.1 & B.3.

3.3 GROUNDING

Except where specifically indicated otherwise, all exposed non-current carrying metallic parts of telephone equipment, cable sheaths, cable splices, and terminals shall be grounded. Grounding shall be in accordance with requirements of NFPA 70, Articles 800-33 and 800-40. Meeting requirements of EIA ANSI/TIA/EIA-568-607.

3.3.1 Ground Bars

3.3.1.1 Telecommunications Master Ground Bar (TMGB)

A copper TMGB shall be provided, in accordance with EIA ANSI/TIA/EIA-607, to be the hub of the basic grounding system by providing a common point of connection for ground from outside cable, MDF, and equipment. The TMGB shall have a ground resistance, including ground, of 10 ohms or less.

3.3.1.2 Telecommunications Ground Bar (TGB)

Copper TGB shall be provided in accordance with EIA ANSI/TIA/EIA-607 in each communications closet and room and each frame. The TGB shall be connected to the TMGB in accordance with EIA ANSI/TIA/EIA-607. Each TGB shall be connected to the TMGB by the most direct route utilizing a copper wire conductor with a total resistance of less than 0.01 ohms.

3.3.2 Incoming Outside Plant Cables

All incoming outside plant cable shields shall be bonded directly to the TMGB or the closest TGB.

3.3.3 Cable Stubs

All shields of cable stubs shall be bonded to a TGB located on the frame.

3.3.4 Shields

The shields of all incoming cables shall not be bonded across the splice to the cable stubs.

3.3.5 Protection Assemblies

The protector assemblies shall be mounted directly on the vertical frame ironwork. The assemblies mounted on each vertical frame shall be connected with a No. 6 AWG copper conductor to provide a low resistance path to the TGB.

3.3.6 Manholes

The shields of all cables in each manhole shall be bonded together by a bonding wire or ribbon. At intermediate manholes, where the cable is pulled through without a sheath opening, bonds are not required. If the manhole has a lacerating bonding ribbon, the shields of spliced cables shall be attached to it.

3.4 CUTOVER AND RECORDS

All necessary transfers and cutovers, shall be accomplished by the Contractor.

3.5 ACCEPTANCE TESTS

The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all required testing. Notification of any planned testing shall be given to the Contracting Officer at least 14 days prior to any test; testing shall not proceed until after the Contractor has received written Contracting Officer's approval of the test plans as specified. The test plans shall define all the tests required to ensure that the system meets technical, operational, and performance specifications. The test plans shall define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans shall identify the capabilities and functions to be tested.

3.5.1 Copper Conductor Cable

The following acceptance tests shall be performed in accordance with RUS REA Bull 1753F-201 (PC-4): and EIA ANSI/TIA/EIA-568-B.1 & B.3

- a. Shield continuity.
- b. Conductor continuity.
- c. Conductor insulation resistance.
- d. Structural return loss.
- e. Cable insertion loss and loss margin at carrier frequencies.
- f. Shield ground for single jacketed cables.
- g. DC loop resistance.

3.5.2 Fiber Optic Cable

Two optical tests shall be performed on all optical fibers: Optical Time Domain Reflectometry (OTDR) Test, and Attenuation Test. In addition, a Bandwidth Test shall be performed on all multi-mode optical fibers. These tests shall be performed on the completed end-to-end spans which include the near-end pre-connectorized single fiber cable assembly, outside plant as specified, and the far-end pre-connectorized single fiber cable assembly.

3.5.2.1 OTDR Test

The OTDR test shall be used to determine the adequacy of the cable installations by showing any irregularities, such as discontinuities, micro-bendings, improper splices, for the cable span under test. Hard copy fiber signature records shall be obtained from the OTDR for each fiber in each span and shall be included in the test results. The OTDR test shall be measured in both directions. A reference length of fiber, 1 km minimum, used as the delay line shall be placed before the new end connector and after the far end patch panel connectors for inspection of connector signature. The OTDR test shall be conducted in accordance with EIA ANSI/EIA 455-81A-91 for single-mode fiber and EIA ANSI/EIA/TIA-455-78A-98

for multi-mode fiber. Splice losses shall not exceed 0.1db. Attenuation losses shall not exceed 0.5 db/km at 1310 nm and 1550 nm for single-mode fiber. Attenuation losses shall not exceed 5.0 db/km at 850 nm and 1.5 db/km at 1300 nm for multi-mode fiber. All shall be compliance with EIA ANSI/TIA/EIA-568-B.1 & B.3

3.5.2.2 Attenuation Test

End-to-end attenuation measurements shall be made on all fibers, in both directions, using both 850 and 1300 nanometer light source at one end and the optical power meter on the other end to verify that the cable system attenuation requirements are met. The measurement method shall be in accordance with EIA ANSI/EIA/TIA-455-53A and EIA ANSI/TIA/EIA-568-B.1 & B.3.

3.5.2.3 Bandwidth Test

The end-to-end bandwidth of all multi-mode fiber span links shall be measured by the frequency domain method. The bandwidth shall be measured in both directions on all fibers. The bandwidth measurements shall be in accordance with EIA ANSI/EIA/TIA-455-30B and EIA ANSI/TIA/EIA-568-B.1 & B.3.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16768

FIBER OPTIC DATA TRANSMISSION SYSTEM

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SYSTEM DESCRIPTION
 - 1.3.1 General
 - 1.3.2 Environmental Requirements
 - 1.3.3 Hazardous Environment
 - 1.3.4 Electrical Requirements
 - 1.3.5 Input Line Surge Protection
 - 1.3.6 Power Line Surge Protection
- 1.4 DELIVERY OF TECHNICAL DATA
 - 1.4.1 Group I Technical Data Package
 - 1.4.1.1 System Drawings
 - 1.4.1.2 Equipment Data
 - 1.4.1.3 Data Transmission System Description and Analyses
 - 1.4.1.4 System Overall Reliability Calculations
 - 1.4.1.5 Certifications
 - 1.4.2 Group II Technical Data Package
 - 1.4.3 Group III Technical Data Package
 - 1.4.4 Group IV Technical Data Package
 - 1.4.4.1 Performance Verification and Endurance Testing Data
 - 1.4.4.2 Operation and Maintenance Data
 - 1.4.4.3 Training Data
 - 1.4.5 Group V Technical Data Package
 - 1.4.5.1 Functional Design Manual
 - 1.4.5.2 Hardware Manual
 - 1.4.5.3 Operator's Manual
 - 1.4.5.4 Maintenance Manual

PART 2 PRODUCTS

- 2.1 FO MODEMS
 - 2.1.1 FO Modem Operating Wavelength
 - 2.1.2 FO Modem Inputs and Outputs
- 2.2 FO TRANSMITTER AND RECEIVER MODULES
 - 2.2.1 Analog FO Transmitter and Receiver Modules
 - 2.2.2 Digital FO Transmitter and Receiver Modules
 - 2.2.3 FO Transmitter Module
 - 2.2.4 FO Receiver Module
- 2.3 FO DIGITAL REPEATERS
- 2.4 FO ANALOG REPEATERS
- 2.5 TRANSCEIVERS FOR VIDEO APPLICATIONS
- 2.6 TRANSCEIVERS FOR LAN APPLICATIONS
- 2.7 FO SWITCHES
- 2.8 FO ACTIVE STAR UNIT

- 2.9 FIBER OPTIC DROP REPEATERS (FODR)
- 2.10 DATA TRANSMISSION CONVERTER
- 2.11 ENCLOSURES
 - 2.11.1 Interior
 - 2.11.2 Exterior
- 2.12 TAMPER AND PHYSICAL PROTECTION PROVISIONS
- 2.13 SYSTEM REQUIREMENTS
 - 2.13.1 Signal Transmission Format Code
 - 2.13.2 Flux Budget/Gain Margin
 - 2.13.3 Receiver Dynamic Range
- 2.14 OPTICAL FIBERS
 - 2.14.1 General
 - 2.14.2 62.5 Micron Multimode Fibers
- 2.15 CROSS-CONNECTS
 - 2.15.1 Patch Panels
 - 2.15.2 Patch Cords
- 2.16 CABLE CONSTRUCTION
 - 2.16.1 General
 - 2.16.2 Exterior Cable
 - 2.16.2.1 Duct Cable
 - 2.16.3 Interior Cable
 - 2.16.4 Pigtail Cables
- 2.17 FO CONNECTORS
- 2.18 MECHANICAL SPLICES
- 2.19 CONDUIT, FITTINGS AND ENCLOSURES

PART 3 EXECUTION

- 3.1 INSTALLATION
 - 3.1.1 Interior Work
 - 3.1.2 Exterior Underground Cable
 - 3.1.3 Service Loops
 - 3.1.4 Metallic Sheath Grounding
 - 3.1.5 Splices
 - 3.1.6 Connectors
 - 3.1.7 Identification and Labeling
 - 3.1.8 Enclosure Sizing and Cable
 - 3.1.9 Enclosure Penetrations
 - 3.1.10 Conduit-Enclosure Connections
- 3.2 TESTING
 - 3.2.1 General
 - 3.2.2 Contractor's Field Test
 - 3.2.2.1 Optical Time Domain Reflectometer Tests
 - 3.2.2.2 Power Attenuation Test
 - 3.2.2.3 Gain Margin Test
 - 3.2.2.4 Analog Video
 - 3.2.2.5 Performance Verification Test and Endurance Test
- 3.3 TRAINING
 - 3.3.1 General
 - 3.3.2 Maintenance Personnel Training

-- End of Section Table of Contents --

SECTION 16768

FIBER OPTIC DATA TRANSMISSION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

47 CFR 15 Radio Frequency Devices

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA 170	(1957) Electrical Performance Standards - Monochrome Television Studio Facilities
EIA ANSI/EIA/TIA-232-F	(1997) Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
EIA ANSI/EIA-310-D	(1992) Cabinets, Racks, Panels, and Associated Equipment
EIA ANSI/TIA/EIA-455-13A	(1996) FOTP-13 Visual and Mechanical Inspection of Fiber Optic Components, Devices, and Assemblies
EIA ANSI/EIA/TIA-455-25B	(1996) FOTP-25 Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies
EIA ANSI/EIA/TIA-455-30B	(1991) FOTP-30 Frequency Domain Measurement of Multimode Optical Fiber Information Transmission Capacity
EIA ANSI/TIA/EIA-455-41A	(1993) FOTP-41 Compressive Loading Resistance of Fiber Optic Cables
EIA ANSI/EIA/TIA-455-46A	(1990) FOTP-46 Spectral Attenuation Measurement for Long-Length, Graded-Index Optical Fibers
EIA ANSI/EIA/TIA-455-47B	(1992) FOTP-47 Output Far Field Radiation Pattern Measurement
EIA ANSI/EIA/TIA-455-58A	(1990) FOTP-58 Core Diameter Measurement of Graded-Index Optical Fibers
EIA ANSI/EIA/TIA-455-59	(1989) FOTP-59 Measurement of Fiber Point Defects Using an OTDR

EIA ANSI/EIA/TIA-455-61	(1989) FOTP-61 Measurement of Fiber or Cable Attenuation Using an OTDR
EIA ANSI/EIA-455-81A-91	(1992) FOTP-81 Compound Flow (Drip) Test for Filled Fiber Optic Cable
EIA ANSI/EIA/TIA-455-82B	(1992) FOTP-82 Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable
EIA-455-88	(1987) FOTP-88 Fiber Optic Cable Bend Test
EIA ANSI/EIA-455-91	(1986; R 1996) FOTP-91 Fiber Optic Cable Twist-Bend Test
EIA ANSI/TIA/EIA-455-104A	(1993) FOTP-104 Fiber Optic Cable Cyclic Flexing Test
EIA ANSI/EIA/TIA-455-170	(1989) FOTP-170 Cable Cutoff Wavelength of Single-Mode Fiber by Transmitted Power
EIA ANSI/EIA-455-171	(1987) FOTP-171 Attenuation by Substitution Measurement - for Short-Length Multimode Graded-Index and Single-Mode Optical Fiber Cable Assemblies
EIA ANSI/TIA/EIA-455-177A	(1992) FOTP-177 Numerical Aperture Measurement of Graded-Index Optical Fibers
EIA ANSI/TIA/EIA-485-A	(1998) Standard for Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems
EIA ANSI/TIA/EIA-568-B.1	(2001) Field testing requirements.
EIA ANSI/TIA/EIA-568-B.2	(2001) Cabling system requirements.
EIA ANSI/TIA/EIA-568-B.3	(2001) Optical fiber cabling systems requirements.
EIA ANSI/TIA/EIA-569-A	(2000) Pathways and spaces
EIA ANSI/TIA/EIA-606	(1993) Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(1997) National Electrical Safety Code
IEEE C62.41	(1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits
IEEE 802.3ae	(2001) Fiber cabling objectives.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1991) Enclosures for Electrical Equipment
----------	--------------------------------------------

(1000 volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 910 (1998) Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air

UL 1666 (1997; R Jan 1999) Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fiber Optic System; G, RE
Installation; G, RE

Detail drawings including a complete list of equipment and material, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Detail drawings shall contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function with its associated systems. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operations. System drawings shall show final configuration, including location, type and termination of inside fiber optics and showing the location, duct and innerduct arrangement, or fiber assignment of outside plant. The ac power consumption and heat dissipation shall be shown under both normal and maximum operating conditions.

SD-03 Product Data

Fiber Optic System; G, RE

Equipment calculations for flux budgets and gain margins.

Spare Parts; G, RE

Data lists of spare parts, tools, and test equipment for each different item of material and equipment specified, after approval of detail drawings not later than 1 months prior to the date of beneficial occupancy. The data shall include a list of parts and

supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 3 years of service.

Manufacturer's Instructions; G, RE

Where installation procedures, or any part thereof, are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be submitted prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received and approved.

Test Procedures and reports; G, RE

Test plans shall define tests required to ensure that the system meets technical, operational, and performance specifications. The test plans shall define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans shall identify the capabilities and functions to be tested.

SD-06 Test Reports

Test Procedures and Reports; G, RE

Test reports, in booklet form showing field tests performed to adjust each component and field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system.

SD-07 Certificates

Fiber Optic System; G, RE

Manufacturer's certificate indicating compliance with transmission and reliability requirements. Where equipment or materials are specified to conform to the standards or publications and requirements of CFR, ANSI, NFPA, EIA, or UL, certificates attesting that the items furnished under this section of the specification conform to the specified requirements.

SD-10 Operation and Maintenance Data

System Maintenance Course;

Six copies of operating instructions outlining the step-by-step procedures required for system operation including description of each subsystem in its operating mode. Instructions shall include the manufacturer's name, service manual, parts list, and a brief description of equipment, components, and their basic operating features. Six copies of the maintenance instructions listing regular maintenance procedures, possible system failures, a troubleshooting guide for repairs, and simplified diagrams for the system as installed. A video describing operating and maintenance instructions may be included.

1.3 SYSTEM DESCRIPTION

1.3.1 General

A fiber optics (FO) data transmission system (DTS) shall be provided. The data transmission system shall consist of fiber optic transmission media, transmitter and receiver modules, FO modems, transceiver modules, repeaters, power line surge protection and terminal devices (such as connectors, patch panels and breakout boxes). The data transmission system shall interconnect system components as shown. Computing devices, as defined in 47 CFR 15, shall be certified to comply with the requirements for Class B computing devices and labeled as set forth in 47 CFR 15, ANSI/TIA/EIA-568-B.1 & B.3 and IEEE 803.2ae.

1.3.2 Environmental Requirements

Equipment and cable to be utilized indoors shall be rated for continuous operation under ambient environmental conditions of 0 to 50 degrees C dry bulb and 10 to 95 percent relative humidity, noncondensing. Equipment shall be rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered for the installed location. Fiber optic cable for outdoor installation shall be rated for Minus 40 to plus 80 degrees C.

1.3.3 Hazardous Environment

System components located in fire or explosion hazard areas shall be rated and installed according to Chapter 5 of NFPA 70 and as shown.

1.3.4 Electrical Requirements

The equipment shall operate from a voltage source as shown, plus or minus 10 percent, and 60 Hz, plus or minus 2 percent.

1.3.5 Input Line Surge Protection

Inputs and outputs shall be protected against surges induced on wiring including wiring installed outdoors. Communications equipment shall be protected against surges induced on any communications circuit. Cables and conductors (except fiber optics which serve as communications circuits from consoles to field equipment) and between field equipment, shall have surge protection circuits installed at each end. Protection shall be furnished at equipment, and additional triple electrode gas surge protectors rated for the application on each wire line circuit shall be installed within 1 meter of the building cable entrance. Fuses shall not be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

- a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An 8 microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

1.3.6 Power Line Surge Protection

Equipment connected to ac circuits shall be protected from power line surges. Equipment shall meet the requirements of IEEE C62.41. Fuses shall not be used for surge protection.

1.4 DELIVERY OF TECHNICAL DATA

Computer software and technical data (including technical data which relates to computer software), which are specifically identified in this specification shall be delivered strictly in accordance with the CONTRACT CLAUSES, SPECIAL CONTRACT REQUIREMENTS, and in accordance with the Contract Data Requirements List (CDRL), DD Form 1423, which is attached to and thereby made a part of this contract. All data delivered shall be identified by reference to the particular specification paragraph against which it is furnished. If the DTM system is being installed in conjunction with another system such as an intrusion detection system, electronic entry control system, closed circuit television system, energy monitoring and control system, or utility monitoring and control system, the Technical Data Packages shall be submitted as part of the Technical Data Package for Section 16415.

1.4.1 Group I Technical Data Package

1.4.1.1 System Drawings

The package shall include the following:

- a. Communications system block diagram.
- b. FO receivers, transmitters, transceivers, and FO modem installation, block diagrams, and wiring diagrams.
- c. FO receivers, transmitters, transceivers, and FO modem physical layout and schematics.
- d. Details of interfaces with other systems.
- e. Details of connections to power sources, including grounding.
- f. Details of surge protection device installations.
- g. Details of cable splicing and connector installations.
- h. Details of aerial cable and messenger installation on poles, cable entrance to buildings, and termination inside enclosures.
- i. Details of underground cable installation, cable entrance into buildings, and terminations inside enclosures.

1.4.1.2 Equipment Data

A complete data package shall be delivered for all material, including field and system equipment.

1.4.1.3 Data Transmission System Description and Analyses

The data package shall include complete system description, and analyses and calculations used in sizing equipment required by these specifications. Descriptions and calculations shall show how the equipment will operate as a system to meet the specified performance. The data package shall include the following:

- a. FO receivers, transmitters, transceivers, FO modem transmit and receive levels, and losses in decibels (dB) on each communication

link.

- b. Digital transmitter and receiver communication speed and protocol description.
- c. Analog signal transmission method and bandwidth of the transmitter and receiver.
- d. Data transmission system expansion capability and method of implementation.
- e. FO system signal-to-noise ratio calculation for each communication link.
- f. Flux-budget and gain margin calculation for each link.

1.4.1.4 System Overall Reliability Calculations

The data package shall include manufacturers' reliability data and calculations required to show compliance with the specified reliability. The calculations shall be based on the configuration specified in Section 16415 and as shown.

1.4.1.5 Certifications

Specified manufacturer's certifications shall be included with the data package meeting ANSI/TIA/EIA-568-B.1 & B.3.

1.4.2 Group II Technical Data Package

The Contractor shall verify that site conditions are in agreement with the design package. The Contractor shall submit a report to the Government documenting changes to the site, or conditions that affect performance of the system to be installed. For those changes or conditions which affect system installation or performance, specification sheets shall be provided (with the report), or written functional requirements to support the findings, and a cost estimate to correct the deficiency. The Contractor shall not correct any deficiency without written permission from the Government.

1.4.3 Group III Technical Data Package

The Contractor shall prepare test procedures and reports for the factory test. A test plan and test procedures shall be prepared in accordance with Section 16415 and this specification. The test procedures shall describe the applicable tests to be performed, and other pertinent information such as specialized test equipment required, length of test, and location of the test. The procedures shall explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements of this specification, and the methods for simulating the necessary conditions of operation to demonstrate performance of the system. The test report shall describe the results of testing to include the date, time, location and system component designations of material and equipment tested. Testing action shall be recorded whether successful or not. Reasons for termination of testing shall be described. Testing work sheets, printouts, strip charts, oscilloscope or OTDR photographs, raw and analyzed data and testing conclusions shall be included in the report. The Contractor shall deliver the test procedures to the Government for approval. After receipt by the Contractor of written approval of the test procedures, the

Contractor may schedule the factory test. The Contractor shall provide written notice of the test to the Government at least 2 weeks prior to the scheduled start. The final test report shall be delivered within 15 days after completion of the test.

1.4.4 Group IV Technical Data Package

1.4.4.1 Performance Verification and Endurance Testing Data

The Contractor shall prepare procedures and reports for the performance verification test and endurance test meeting ANSI/TIA/EIA-568-B.1 & B.3. Test procedures shall be prepared in accordance with Section 16415 and this specification. Testing shall use the configured and installed system as approved by the Government. Where required, the Contractor shall simulate conditions of operation to demonstrate the performance of the system. The test plan shall describe the applicable tests to be performed, other pertinent information such as specialized test equipment required, length of performance verification test and endurance test, and location of the performance verification test and endurance test. The procedures shall explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements of this specification, and the methods for simulating the necessary conditions of operation to demonstrate performance of the system. The test report shall describe the results of testing to include the date, time, location and system component designations of material and equipment tested. Testing action shall be recorded whether successful or not. Reasons for termination of testing for any reason shall be recorded in the report. Testing work sheets, printouts, strip charts, oscilloscope or OTDR photographs, raw data, analyzed data and testing conclusions shall be included in the report. The Contractor shall deliver the performance verification test and endurance test procedures to the Government for approval. After receipt of written approval of test procedures, the Contractor may schedule the performance verification and endurance tests. The Contractor shall provide written notice of the performance verification test and the endurance test to the Government at least 2 weeks prior to the scheduled start of the test. The final performance verification test and endurance test report shall be delivered 30 days after completion of testing.

1.4.4.2 Operation and Maintenance Data

A draft copy of the operation and maintenance data, in manual format, as specified for the Group V technical data package, shall be delivered to the Government prior to beginning the performance verification test for use during site testing.

1.4.4.3 Training Data

Lesson plans and training manuals, including type of training to be provided, with a list of reference material shall be delivered for approval by the Government prior to starting any training.

1.4.5 Group V Technical Data Package

The Group V package consists of the operation and maintenance data, in manual format. Final copies of the manuals bound in hardback, loose-leaf binders, shall be delivered to the Government within 30 days after completing the endurance test. The draft copy used during site testing shall be updated with any changes required prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The

manuals shall include the names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and of the nearest service representative for each item of equipment and each system. The manuals shall have a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the endurance test shall include all modifications made during installation, checkout, and acceptance. Manuals delivered shall include:

- a. Functional Design Manual: two copies.
- b. Hardware Manual: two copies.
- c. Operator's Manual: six copies.
- d. Maintenance Manuals: two copies.

1.4.5.1 Functional Design Manual

The functional design manual shall identify the operational requirements for the data transmission system and explain the theory of operation, design philosophy, and specific functions. A description of hardware functions, interfaces, and requirements shall be included for all system operating modes.

1.4.5.2 Hardware Manual

A manual describing equipment furnished, including:

- a. General description and specifications.
- b. Installation and checkout procedures.
- c. Equipment electrical schematics and layout drawings.
- d. Data transmission systems schematics.
- e. Alignment and calibration procedures.
- f. Manufacturer's repair parts list indicating sources of supply.
- g. Interface definition.

1.4.5.3 Operator's Manual

The operator's manual shall fully explain procedures and instructions for operation of the system.

1.4.5.4 Maintenance Manual

The maintenance manual shall include descriptions of maintenance for all equipment including inspection, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components.

PART 2 PRODUCTS

2.1 FO MODEMS

FO modems shall be selected to meet FO system requirements. The modems

shall allow full duplex, asynchronous, point-to-point digital communication using an FO pair. Meeting ANSI/TIA/EIA-568-B.1 & B.3

2.1.1 FO Modem Operating Wavelength

The operating wavelength shall be centered on 850 nanometers.

2.1.2 FO Modem Inputs and Outputs

FO modems shall accept inputs and provide outputs compatible with EIA ANSI/EIA/TIA-232-F. Digital data rates through each link shall be 1.54 MBPS. Meeting ANSI/TIA/EIA-568-B.1 & B.3

2.2 FO TRANSMITTER AND RECEIVER MODULES

FO transmitter/receiver pairs shall have signal-to-noise power ratio of 40 dB or better after photo detection at the receiver. Transmitter power output and receiver sensitivity shall not drift more than plus or minus 2 dB over their operational life. Meeting ANSI/TIA/EIA-568-B.1 & B.3

2.2.1 Analog FO Transmitter and Receiver Modules

FO transmitter/receiver pairs used to pass analog video signals shall accept inputs and provide outputs that comply with EIA 170 and shall have a bandwidth of 6 MHz or greater.

2.2.2 Digital FO Transmitter and Receiver Modules

FO transmitter/receiver pairs used to pass digital signals shall accept inputs and provide outputs compatible with EIA ANSI/EIA/TIA-232-F. Digital data rates through each link shall be 1.54 MBPS. FO transmitter and receiver modules shall be housed in field equipment enclosures where possible and/or in new enclosures. FO transmitter and receiver modules shall be compatible with each other, the FO cable, and connectors.

2.2.3 FO Transmitter Module

The FO transmitter shall accept electronic signals and shall modulate a light source. The light source shall be coupled into an FO cable. The operating wavelength shall be centered on 850 nanometers.

2.2.4 FO Receiver Module

The FO receiver module shall receive light from the FO cable and shall convert this light into an electronic signal identical to the electronic signal applied to the FO transmitter module. The operating wavelength shall be the same as the transmitter.

2.3 FO DIGITAL REPEATERS

FO digital repeaters shall be used to extend the range of the FO data transmission system when necessary to meet the requirements of paragraph SYSTEM REQUIREMENTS. For simplex circuits, the repeater shall consist of an FO receiver connected to an FO transmitter. For Duplex circuits, the repeater shall consist of a pair of FO receivers that are connected to a pair of FO transmitters. The FO receivers shall receive the optical signal and drive the transmitters. The transmitters shall regenerate the optical signal at the transmission rate specified. The FO repeater shall be mechanically and optically compatible with the remainder of the FO system.

Meeting ANSI/TIA/EIA-568-B.1 & B.3

2.4 FO ANALOG REPEATERS

FO analog repeaters shall be used to extend the range of the FO data transmission system when necessary to meet the requirements of the paragraph SYSTEM REQUIREMENTS. For simplex circuits, the repeater shall consist of an FO receiver connected to an FO transmitter. For duplex circuits, the repeater shall consist of a pair of FO receivers that are connected to a pair of FO transmitters. The FO receivers shall receive the optical signal and drive the transmitters. The transmitters shall regenerate the optical signal in compliance with EIA 170. The FO repeater shall be mechanically and optically compatible with the remainder of the FO system. Meeting ANSI/TIA/EIA-568-B.1 & B.3

2.5 TRANSCEIVERS FOR VIDEO APPLICATIONS

FO Transceivers shall allow bi-directional signal transmission on a single fiber. The operating wavelength shall be centered on 850 nanometers in one direction and centered on 1330 nanometers in the other direction. Crosstalk attenuation between channels shall be 40 dB or greater. FO transceivers shall be selected to match or exceed the highest data rate of attached input devices. The FO transceiver shall be mechanically and optically compatible with the remainder of the FO system. Meeting ANSI/TIA/EIA-568-B.1 & B.3

2.6 TRANSCEIVERS FOR LAN APPLICATIONS

Transceivers for FO LAN applications shall be active units, compatible with the LAN cards, modems and repeaters used in the system. Indicators provided shall be for power, collision detection, receive, transmit, and status. Power for transceivers shall be derived from the AUI port of LAN equipment or from a dedicated power supply. Transceiver loss characteristics shall be less than 1.0 db. Connectors shall be low loss and compatible with LAN equipment. Circuitry shall be included so when a device is disconnected, other devices on the LAN continue to operate without any disruption. Meeting ANSI/TIA/EIA-568-B.1 & B.3

2.7 FO SWITCHES

FO switches shall be single pole, double throw. Switching speed shall be less than 15 milliseconds. Insertion loss shall be less than 1.5 dB. Crosstalk attenuation between FO outputs shall be 40 dB or greater. FO switches shall be latching or nonlatching as shown. Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements

2.8 FO ACTIVE STAR UNIT

FO active star units shall provide full-duplex communications in a multi-point configuration. Each unit shall have one input port module and up to four output port modules. FO active star units shall be mechanically and optically compatible with the remainder of the FO system. The star unit shall allow a mixed configuration of port module operating wavelengths and single-mode or multimode FO cables. Each port module shall have a separate FO cable input and output. Port modules shall be connected using an electronic data bus. Port module FO transmitters shall regenerate the optical signal at the transmission rate specified. Port modules shall be rack-mounted in a 483 millimeters rack complying with EIA ANSI/EIA-310-D. The total propagation delay through the star unit shall be less than 100

nanoseconds. Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements

2.9 FIBER OPTIC DROP REPEATERS (FODR)

FODRs shall combine the features specified for Fiber Optical Digital Repeaters and Local Area Network (LAN) transceivers. FODRs shall regenerate the optical signal at the transmission rate specified. The FODRs shall be mechanically and optically compatible with the remainder of the Fiber Optic system. FODRs shall restore the optical signals amplitude, timing and waveform. The FODR shall provide an electrical interface to the transmission media. The electrical interface shall be identical to all other network interfaces as specified. Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements

2.10 DATA TRANSMISSION CONVERTER

Data transmission converters shall be used to connect equipment using EIA ANSI/TIA/EIA-485-A and Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements data transmission when necessary and as shown. Converters shall operate full duplex and support two wire circuits at speeds up to 2 megabytes per second and have a built in 120 Ohm terminating resistor. Converters shall be mechanically, electrically, and optically compatible with the system.

2.11 ENCLOSURES

Enclosures shall conform to the requirements of NEMA 250 for the types specified. Finish color shall be the manufacturer's standard, unless otherwise indicated. Damaged surfaces shall be repaired and refinished using original type finish.

2.11.1 Interior

Enclosures installed indoors shall meet the requirements of Type 12 or as shown.

2.11.2 Exterior

Enclosures installed outdoors shall meet the requirements of Type 4X metallic.

2.12 TAMPER AND PHYSICAL PROTECTION PROVISIONS

Enclosures and fittings of every description having hinged doors or removable covers, and which contain any part of the FO circuits or power supplies, shall be provided with cover-operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed. The enclosure and the tamper switch shall function together to not allow direct line of sight to any internal components and tampering with the switch or the circuits before the switch activates. Tamper switches shall be inaccessible until the switch is activated; have mounting hardware concealed so that the location of the switch cannot be observed from the exterior of the enclosure; be connected to circuits which are under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door cover; and shall be wired so that they break the circuit when the door or cover is disturbed. Tamper switches on the doors which must be opened to make routine maintenance adjustments to the system and to service the

power supplies shall be push/pull-set, automatic reset type. Covers of pull and junction boxes provided to facilitate installation of the system need not be provided with tamper switches if they contain no splices or connections, but shall be protected by [security screws] [tack welding or brazing] to hold the covers in place. Zinc labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate that the box is part of a security system. Any damage to the enclosure or its cover's surface protection shall be cleaned and repaired using the same type of surface protection as the original enclosure.

2.13 SYSTEM REQUIREMENTS

2.13.1 Signal Transmission Format Code

FO equipment shall use the same transmission code format from the beginning of a circuit to the end of that circuit. Different transmission code formats may be used for different circuits as required to interconnect supported equipment. Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements

2.13.2 Flux Budget/Gain Margin

FO links shall have a minimum gain margin of 6 dB. The flux budget is the difference between the transmitter output power and the receiver input power required for signal discrimination when both are expressed in dBm. The flux budget shall be equal to the sum of losses (such as insertion losses, connector and splice losses, and transmission losses) plus the gain margin. When a repeater or other signal regenerating device is inserted to extend the length of an FO circuit, both the circuit between the transmitter and the repeater-transmitter, and the circuit between the repeater-transmitter and the receiver are considered independent FO links for gain margin calculations.

2.13.3 Receiver Dynamic Range

The dynamic range of receivers shall be large enough to accommodate both the worst-case, minimum receiver flux density and the maximum possible, receiver flux density. The receiver dynamic range shall be at least 15 dB. Where required, optical attenuators shall be used to force the FO link power to fall within the receiver dynamic range.

2.14 OPTICAL FIBERS

2.14.1 General

Optical fibers shall be coated with a suitable material to preserve the intrinsic strength of the glass. The outside diameter of the glass-cladded fiber shall be nominally 125 microns, and shall be concentric with the fiber core. Optical fibers shall meet EIA ANSI/EIA/TIA-455-46A, and EIA ANSI/TIA/EIA-455-177A and ANSI/TIA/EIA-568-B.1 & B.3.

2.14.2 62.5 Micron Multimode Fibers

Conductors shall be multimode, graded index, solid glass waveguides with a nominal core diameter of 62.5 microns. The fiber shall have transmission windows centered at 850 and 1330 nanometer wavelengths. The numerical aperture for each fiber shall be a minimum of 0.275. The attenuation at 850 nanometers shall be 4.0 dB/Km or less. The attenuation at 1330 nanometers shall be 1.5 dB/Km or less. The minimum bandwidth shall be 160 MHz-Km at 850 nanometers and 400 MHz-Km at 1300 nanometers. FO cable shall

be certified to meet EIA ANSI/EIA/TIA-455-30B and EIA ANSI/EIA/TIA-455-58A and ANSI/TIA/EIA-568-B.1 & B.3.

2.15 CROSS-CONNECTS

2.15.1 Patch Panels

Patch panels shall be a complete system of components by a single manufacturer, and shall provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection. Patch panel connectors and couplers shall be the same type and configuration as used elsewhere in the system. Panels shall be as shown Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements.

2.15.2 Patch Cords

Patch cords shall be cable assemblies consisting of flexible optical fiber cable with connectors of the same type as used elsewhere in the system. Optical fiber shall be the same type as used elsewhere in the system. Patch cords shall be complete assemblies from manufacturer's standard products.

2.16 CABLE CONSTRUCTION

2.16.1 General

The cable shall contain a minimum of two fiber optic conductors for each full duplex circuit. The number of fibers in each cable shall be 12 or as shown. Each fiber shall be protected by a protective tube. Cables shall have a jacketed strength member, and an exterior jacket. Cable and fiber protective covering shall be free from holes, splits, blisters, and other imperfections. The covering shall be flame retardant, moisture resistant, non-nutrient to fungus, ultraviolet light resistant as specified and nontoxic. Mechanical stress present in cable shall not be transmitted to the optical fibers. Strength members shall be non-metallic and shall be an integral part of the cable construction. The combined strength of all the strength members shall be sufficient to support the stress of installation and to protect the cable in service. The exterior cables shall have a minimum storage temperature range of minus 20 to plus 75 degrees C. Interior cables shall have a minimum storage temperature of minus 10 to plus 75 degrees C. All cables furnished shall meet the requirement of NFPA 70. Fire resistant characteristics of cables shall conform to Article 770, Sections 49, 50, and 51. A flooding compound shall be applied into the interior of the fiber tubes, into the interstitial spaces between the tubes, to the core covering, and between the core covering and jacket of all cable to be installed aerially, underground, and in locations susceptible to moisture. Flooded cables shall comply with EIA ANSI/EIA-455-81A-91 and EIA ANSI/EIA/TIA-455-82B. Cables shall be from the same manufacturer, of the same cable type, and of the same size. Each fiber and protective coverings shall be continuous with no factory splices. Fiber optic cable assemblies, including jacketing and fibers, shall be certified by the manufacturer to have a minimum life of 30 years. Plenum cable shall meet UL 910, and riser cable shall meet UL 1666. FO cable shall be certified to meet the following: EIA ANSI/TIA/EIA-455-13A, EIA ANSI/EIA/TIA-455-25B, EIA ANSI/TIA/EIA-455-41A, EIA ANSI/EIA/TIA-455-47B, EIA ANSI/EIA/TIA-455-59, EIA ANSI/EIA/TIA-455-61, EIA-455-88, EIA ANSI/EIA-455-91, EIA ANSI/TIA/EIA-455-104A, and EIA ANSI/EIA-455-171 and ANSI/TIA/EIA-568-B.1 & B.3 requirements.

2.16.2 Exterior Cable

2.16.2.1 Duct Cable

The optical fibers shall be surrounded by a tube buffer, shall be contained in a channel or otherwise loosely packaged to provide clearance between the fibers and inside of the container, and shall be extruded from a material having a coefficient of friction sufficiently low to allow the fiber free movement.

- a. The cable outer jacket shall be medium density polyethylene material with orange pigment added for ease of identification.
- b. Tensile strength: Cables shall withstand an installation tensile load of not less than 2700 Newtons and not less than 600 Newtons continuous tensile load.
- c. Impact and Crush resistance: The cables shall withstand an impact of 3 Newton-meters as a minimum, and shall have a crush resistance of 220 Newtons per square centimeter as a minimum.

2.16.3 Interior Cable

- a. Loose buffer tube cable construction shall be such that the optical fibers shall be surrounded by a tube buffer, shall be contained in a channel or otherwise loosely packaged to provide clearance between the fibers and the inside of the container to allow for thermal expansions without constraining the fiber. The protective container shall be extruded from a material having a coefficient of friction sufficiently low to allow the fiber free movement. The cable outer jacket shall be flame retardant polyvinyl chloride (PVC) or fluorocopolymer (FCP), which complies with NFPA 70 for OFNP applications. Tensile strength, impact resistance, and crush resistance shall not exceed manufacturers recommendations.
- b. Tight buffer tube cable construction shall be extrusion of plastic over each cladded fiber, with an outer jacket of flame retardant PVC or FCP, which complies with NFPA 70 for OFNR requirements for riser cables and vertical shaft installations. Optical fibers shall be covered in near contact with an extrusion tube and shall have an intermediate soft buffer to allow for the thermal expansions and minor pressures. Tensile strength, impact resistance, and crush resistance shall not exceed manufacturers recommendations.
- c. Plenum Rated Cables: Cable to be installed inside plenums shall additionally meet the requirements of UL 910.

2.16.4 Pigtail Cables

Cable used for connections to equipment shall be flexible fiber pigtail cables having the same physical and operational characteristics as the parent cable. The cable jacket shall be flame retardant PVC or FCP, which complies with NFPA 70 for OFNP applications. Maximum dB loss for pigtail cable shall be 3.5 dB/km at 850 nanometers, and 1.0 dB/km at 1330 nanometers.

2.17 FO CONNECTORS

FO connectors shall be the straight tip, bayonet style, field installable, self-aligning and centering. FO connectors shall match the fiber core and cladding diameters. The connector coupler shall be stainless steel and the alignment ferrule shall be ceramic. FO equipment and cable shall use the same type connectors. Connector insertion loss shall be nominally 0.3 dB and less than 0.7 dB. Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements

2.18 MECHANICAL SPLICES

Mechanical splices shall be suitable for installation in the field. External power sources shall not be required to complete a splice. Splices shall be self-aligning for optimum signal coupling. Mechanical splices shall not be used for exterior applications where they may be buried underground or laced to aerial messenger cables. Mechanical splices may be used for interior locations and within enclosures. Splice closures shall protect the spliced fibers from moisture and shall prevent physical damage. Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements

The splice closure shall provide strain relief for the cable and the fibers at the splice points.

2.19 CONDUIT, FITTINGS AND ENCLOSURES

Conduit shall be as specified in Section 16415 ELECTRICAL WORK, INTERIOR, and Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND, and as shown.

PART 3 EXECUTION

3.1 INSTALLATION

System components and appurtenances shall be installed in accordance with the manufacturer's instructions and as shown. Interconnections, services, and adjustments required for a complete and operable data transmission system shall be provided. Meeting ANSI/TIA/EIA-568-B.1 & B.3 requirements

3.1.1 Interior Work

Conduits, tubing and cable trays for interior FO cable interior shall be installed as specified in Section 16415 ELECTRICAL WORK, INTERIOR and as shown. Cable installation and applications shall meet the requirements of NFPA 70, Article 770, Sections 52 and 53. Cables not installed in conduits or wireways shall be properly secured and neat in appearance, and if installed in plenums or other spaces used for environmental air, shall comply with NFPA 70 requirements for this type of installation.

3.1.2 Exterior Underground Cable

Except as otherwise specified, conduits, ducts, and manholes for underground FO cable systems shall be installed as specified in Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND and as shown.

- a. Minimum burial depth for cable shall be 750 millimeters, but not less than the depth of the frost line. Burial depth specified shall take precedence over any requirements specified elsewhere.
- b. Where direct burial cable will pass under sidewalks, roads, or other paved areas and no existing conduits or duct banks are available, the cable shall be placed in a 25.4 millimeter rigid

coated galvanized steel conduit or larger as required to limit conduit fill to 80 percent or less. Conduit may be installed by jacking or trenching, as approved.

- c. Buried cables shall be placed below a plastic warning tape buried in the same trench or slot. The tape shall be 300 millimeters above the cable. The warning tape shall be continuously imprinted with the words "WARNING - COMMUNICATIONS CABLE BELOW" at not more than 1300 millimeters intervals. The plastic tape shall be acid and alkali resistant polyethylene film, 76.2 millimeters wide with a minimum thickness of 0.1 millimeter. Tape shall have a minimum strength of 12066 kilo Pascals lengthwise and 10342 kilo Pascals crosswise.
- d. Transitions from underground cable to aerial cable shall be as specified for CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SYSTEMS in Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND and as shown.
- e. For cables installed in ducts and conduit, a cable lubricant compatible with the cable sheathing material shall be used on all cables pulled. Pulling fixtures shall be attached to the cable strength members. If indirect attachments are used, the grip diameter and length shall be matched to the cable diameter and characteristics. If an indirect attachment is used on cables having only central strength members, the pulling forces shall be reduced to ensure that the fibers are not damaged from forces being transmitted to the strength member. During pulling the cable pull line tension shall be continuously monitored using dynamometers or load-cell instruments, and shall not exceed the maximum tension specified by the cable manufacturer. The mechanical stress placed upon the cable during installation shall be such that the cable is not twisted or stretched. A cable feeder guide shall be used between the cable reel and the face of the duct or conduit to protect the cable and guide it into the duct or conduit as it is unspooled from the reel. As the cable is unspooled from the reel, it shall be inspected for jacket defects or damage. The cable shall not be kinked or crushed and the minimum bend radius of the cable shall not be exceeded during installation. Cable shall be hand fed and guided through each manhole and additional lubricant shall be applied at all intermediate manholes. When practicable, the center pulling technique shall be used to lower pulling tension. That is, the cable shall be pulled from the center point of the cable run towards the end termination points. The method may require the cable to be pulled in successive pulls. If the cable is pulled out of a junction box or manhole the cable shall be protected from dirt and moisture by laying the cable on a ground covering.

3.1.3 Service Loops

Each fiber optic cable shall have service loops of not less than 3 meters in length at each end. The service loops shall be housed in a service loop enclosure.

3.1.4 Metallic Sheath Grounding

Fiber optic cable with metallic sheath routed in the trench with a power cable shall have the metallic sheath grounded at the cable termination

points.

3.1.5 Splices

No splices will be permitted unless the length of cable being installed exceeds the maximum standard cable length available from a manufacturer or unless fiber optic pigtails are used to connect transmitters, receivers, or other system components for terminations to the fiber. Splices shall be made using the method recommended by the cable manufacturer. Splices shall be housed in a splice enclosure and shall be encapsulated with an epoxy, ultraviolet light cured splice encapsulant or otherwise protected against infiltration of moisture or contaminants. FO splices shall be field tested at the time of splicing. Fusion splices shall have less than 0.2 dB loss.

Mechanical splices shall have less than 0.5 dB loss. There shall be no more than 1 splice per kilometer in any of the FO cables excluding terminations. Field splices shall be located in cable boxes. Sufficient cable shall be provided in each splicing location to properly rack and splice the cables, and to provide extra cable for additional splices. Cable ends shall be protected with end caps except during actual splicing. During the splicing operations, means shall be provided to protect the unspliced portions of the cable and its fibers from the intrusion of moisture and other foreign matter.

3.1.6 Connectors

Connectors shall be as specified in paragraph FO CONNECTORS. Fibers at each end of the cable shall have jumpers or pigtails installed of not less than 1 meter in length. Fibers at both ends of the cable shall have connectors installed on the jumpers. The mated pair loss, without rotational optimization, shall not exceed 1.5 dB. The pull strength between the connector and the attached fiber shall not be less than 22.7 kilograms.

3.1.7 Identification and Labeling

Identification tags or labels shall be provided for each cable. Markers, tags and labels shall use indelible ink or etching which will not fade in sunlight, or in buried or underground applications. Markers, tags, and labels shall not become brittle or deteriorate for a period of 20 years. Label all termination blocks and panels with cable number or pair identifier for cables in accordance with EIA ANSI/TIA/EIA-606 and as specified. The labeling format shall be identified and a complete record shall be provided to the Government with the final documentation. Each cable shall be identified with type of signal being carried and termination points.

3.1.8 Enclosure Sizing and Cable

Termination enclosures shall be sized to accommodate the FO equipment to be installed. Sizing shall include sufficient space for service loops to be provided and to accommodate a neat, workmanlike layout of equipment and the bend radii of fibers and cables terminated inside the enclosure.

3.1.9 Enclosure Penetrations

Enclosure penetrations shall be from the bottom and shall be sealed with rubber silicone sealant to preclude the entry of water. Conduits rising from underground shall be internally sealed.

3.1.10 Conduit-Enclosure Connections

Conduit-enclosure connections shall be protected by tack welding or brazing the conduit to the enclosure. Tack welding or brazing shall be done in addition to standard conduit-enclosure connection methods as described in NFPA 70. Any damage to the enclosure or its cover's surface protection shall be cleaned and repaired using the same type of surface protection as the original enclosure.

3.2 TESTING

3.2.1 General

The Contractor shall provide personnel, equipment, instrumentation, and supplies necessary to perform testing. System shall meet ANSI/TIA/EIA-568-B.1 & B.3 requirements

3.2.2 Contractor's Field Test

The Contractor shall verify the complete operation of the data transmission system in conjunction with field testing associated with systems supported by the fiber optic data transmission system as specified in Section 16375, 16415, 16526, and 16711 prior to formal acceptance testing. Field tests shall include a flux density test. These tests shall be performed on each link and repeated from the opposite end of each link.

3.2.2.1 Optical Time Domain Reflectometer Tests

Optical time domain reflectometer tests shall be performed using the FO test procedures of EIA ANSI/EIA/TIA-455-59. An optical time domain reflectometer test shall be performed on all fibers of the FO cable on the reel prior to installation. The optical time domain reflectometer shall be calibrated to show anomalies of 0.2 dB as a minimum. Photographs of the traces shall be furnished to the Government. An optical time domain reflectometer test shall be performed on all fibers of the FO cable after it is installed. The optical time domain reflectometer shall be calibrated to show anomalies of 0.2 dB as a minimum. If the optical time domain reflectometer test results show anomalies greater than 1 dB, the FO cable segment is unacceptable to the Government. The unsatisfactory segments of cable shall be replaced with a new segment of cable. The new segment of cable shall then be tested to demonstrate acceptability. Photographs of the traces shall be furnished to the Government for each link.

3.2.2.2 Power Attenuation Test

Power attenuation test shall be performed at the light wavelength of the transmitter to be used on the circuit being tested. The flux shall be measured at the FO receiver end and shall be compared to the flux injected at the transmitter end. There shall be a jumper added at each end of the circuit under test so that end connector loss shall be validated. Rotational optimization of the connectors will not be permitted. If the circuit loss exceeds the calculated circuit loss by more than 2 dB, the circuit is unsatisfactory and shall be examined to determine the problem. The Government shall be notified of the problem and what procedures the Contractor proposes to eliminate the problem. The Contractor shall prepare and submit a report documenting the results of the test.

3.2.2.3 Gain Margin Test

The Contractor shall test and verify that each circuit has a gain margin which exceeds the circuit loss by at least 6 dB.

3.2.2.4 Analog Video

Test Analog circuits shall be tested using a signal conforming to EIA 170. The monitor or automated test set shall be stable, and shall be as described in EIA 170. If the result is unsatisfactory, the circuit shall be examined to determine the problem. The Government shall be notified of the problem and of the procedures the Contractor proposes to eliminate the problem. The Contractor shall prepare and submit a report documenting the results of the test.

3.2.2.5 Performance Verification Test and Endurance Test

The FO data transmission system shall be tested as a part of the completed UMCS/EMCS, IDS, Airfield lighting control system, and Data systems during the Performance Verification Test and Endurance Test as specified in Section 16375, 16415, 16526, and 16711.

3.3 TRAINING

3.3.1 General

The Contractor shall conduct a training course for designated personnel in the maintenance of the FO system. The training shall be oriented to the specific system being installed under this specification. The Contractor shall furnish training materials and supplies.

3.3.2 Maintenance Personnel Training

The system maintenance course shall be taught at the project site after completion of the endurance test for a period of 1 training day. A maximum of five personnel designated by the Government will attend the course. A training day shall be 8 hours of classroom or lab instruction, including two 15 minute breaks and excluding lunchtime during the daytime shift in effect at the facility. Training shall include:

- a. Physical layout of the system and each piece of hardware.
- b. Troubleshooting and diagnostics procedures.
- c. Repair instructions.
- d. Preventative maintenance procedures and schedules.
- e. Calibration procedures. Upon completion of this course, the students shall be fully proficient in the maintenance of the system.

-- End of Section --

US Army Corps of Engineers
Sacramento District

DATE: 6/21/01
APPROVED: [Signature]

DESCRIPTION: 100% DESIGN
131-25-1310

DESIGNED BY: M. ZAKSKORN
SPEC NO.: 1139
REV: 1

DATE: 6/21/01
POST NAME: 810E133.DWG
POST SCALE: 1:1

SACRAMENTO DISTRICT
1325 "F" STREET
N-HOUSE DESIGN
SACRAMENTO, CA 95814-2922

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

BEALE AFB
AIR TRAFFIC CONTROL TOWER
POWER, SIGNAL AND LIGHTING
PLAN - LEVEL 12

SHEET
REFERENCE
NUMBER:
E1.33

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

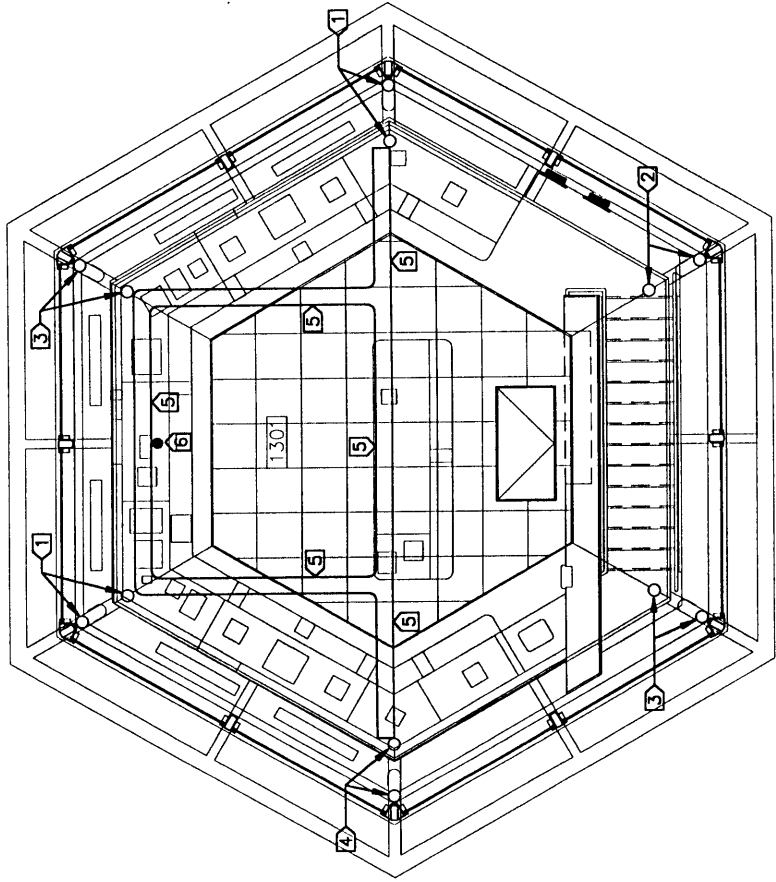
4

4

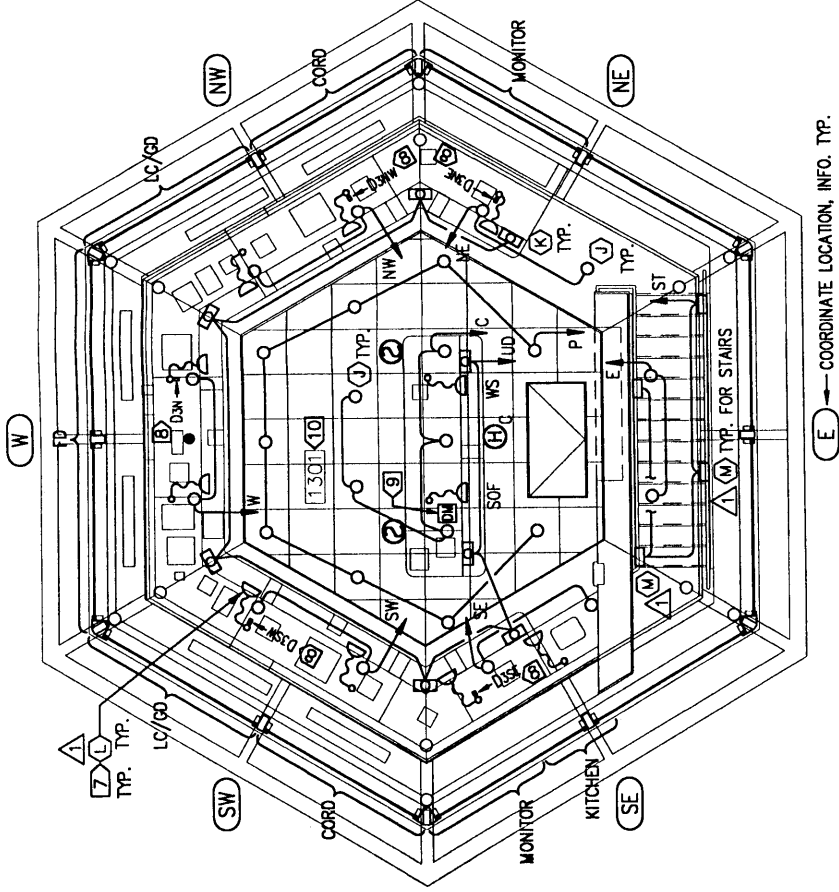
3

2

1



CEILING CABLE TRAY AND COLUMN CONDUIT PLAN - CAB
SCALE: 1:50



—(E)— COORDINATE LOCATION, INFO. TYP.

LIGHTING PLAN - CAB CEILING AND DESK LEVEL
SCALE: 1:50

KEYED NOTES: 01

1. COLUMN RESERVED FOR ANTENNA CABLING (NIC).
2. COLUMN RESERVED FOR LIGHTING, POWER, FIRE ALARM AND SIGNAL CIRCUITS. EACH OF THE SYSTEMS, WHICH ARE AT OR ABOVE THE CEILING, SHALL BE COMBINED PER SYSTEM (LIGHTING, POWER, ETC.) IN ITS OWN CONDUIT. ROUTE THE CONDUIT THROUGH THE COLUMN INDICATED WHEN EXPOSED. SEE ARCHITECTURAL AND STRUCTURAL SHEETS FOR CONDUIT DETAILS.
3. COLUMN RESERVED FOR LIGHTING CONDUCTOR. ROUTE LIGHTNING PROTECTION DOWN CONDUCTORS THROUGH COLUMNS INDICATED TO THE LEVEL BELOW. ROUTE THE DOWN CONDUITS IN CONDUIT. PROVIDE BONDING TO BUILDING STEEL STRUCTURE.
4. COLUMN RESERVED FOR MECHANICAL DRAIN.
5. PROVIDE ABOVE CEILING CABLE TRAY SYSTEM. COORDINATE LOCATION WITH COLUMN CONDUIT PENETRATIONS. VERIFY TRAYS WILL FIT IN THE SPACE PROVIDED PRIOR TO INSTALLING THE SYSTEM. ADJUST LENGTHS AND HEIGHT AS NECESSARY FOR SYSTEM TO FIT INTO THE SPACE PROVIDED. BOND THE CABLE TRAY SYSTEM TO CONDUIT. THE 305 MM CABLE TRAYS SHALL BE INSTALLED 155 MM MINIMUM ABOVE THE SUSPENDED CEILING AND 305 MM BELOW THE STRUCTURAL STEEL BEAMS.
6. ARTICULATING ARM CEILING MOUNT FOR USE WITH STARS FLAT PANEL TOWER DISPLAY MONITOR (GFG). CONTRACTOR SHALL PROVIDE POWER TO J-BOX. SEE ARCHITECTURAL SHEET FOR ARM MOUNTING DETAILS. DEBRITE AND PS&J POWER SUPPLY. ROUTE CIRCUITS VIA COLUMN CONDUIT TO CEILING MOUNTED JBOX.
7. AT EACH POSITION (LC: LOCAL CONTROLLER, FD: FLIGHT DATA, GD: GROUND, SOF: SUPERVISOR OF FLYING, CORD: COORDINATOR, WS: WATCH SUPERVISOR) PROVIDE AS SHOWN ONE GOOSENECK FIXTURE TYPE "L" MOUNT.
8. PROVIDE 3 WAY DIMMING RECESSED DIMMING SWITCH NEXT TO FIXTURE "L" MOUNT.
9. PROVIDE SINGLE AND 3 WAY DIMMING MASTER CONSOLE AT THE SOF CONSOLE. LOCATION OF EQUIPMENT IN MILL WORK SHALL BE COORDINATED WITH THE GOVERNMENT INSTALL EQUIPMENT THROUGH THE CONTRACTING OFFICER FOR THIS EQUIPMENT LOCATION WITH KAM POURRAHMAN, 38 EG/GC (405 734-7226).
10. ALL LIGHTING SERVING THIS FLOOR SHALL BE FEED FROM PANEL L11. INDIVIDUAL CIRCUITS SHALL HAVE SEPARATE NEUTRALS. A GROUND WIRE SHALL BE PROVIDED FOR EACH HOME RUN.

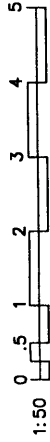
GENERAL NOTE:

1. FOR CAB LIGHTING CONTROL DIAGRAMS AND INFORMATION SEE SHEET E5.14.
2. ALL CONDUIT PENETRATING FIRE RATED WALLS AND FLOORS SHALL BE FIRE BLOCKED WITH NON-HEAT SHRINK MATERIAL OR EQUAL FOR A 2 HOUR RATING AFTER ELECTRICAL COMPONENTS ARE INSTALLED. THIS APPLIES TO ALL FLOORS.

ROOM SCHEDULE	
1301	CAB LEVEL



GRAPHIC SCALE



Sheet
reference
number:
E1.35
Sheet

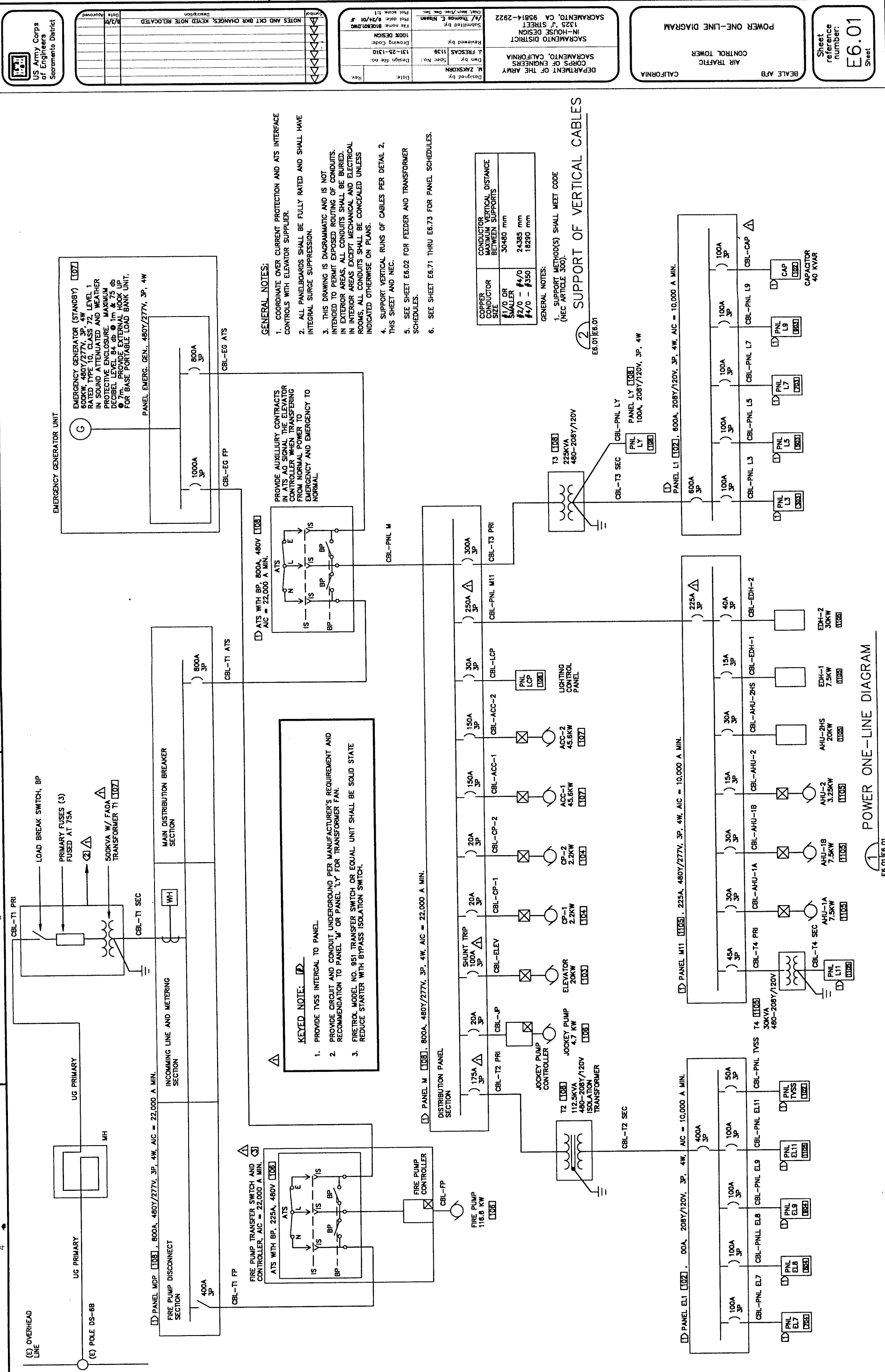
BEALE AFB
AIR TRAFFIC
CONTROL TOWER
PLAN - CAB
CABLE TRAY AND LIGHTING
CALIFORNIA

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA
SACRAMENTO DISTRICT
1325 "I" STREET
SACRAMENTO, CA 95814-2922

Designed by: M. ZAKSKORN
Drawn by: J. FRESCAS
Reviewed by: J. FRESCAS
Submitted by: J. FRESCAS
File name: B10E134.dwg
Plot date: 6/23/01
Plot scale: 1:1
Date: 6/23/01
Rev: 1

Symbol	Description	Date	Approved
XXXXXXXXXX	FIGURE ID CHANGED		

US Army Corps
of Engineers
Sacramento District



US Army Corps of Engineers
Sacramento District

Symbol	Notes
1	NOTES AND CMT BKR CHANGES, KEED NOTE RELOCATED
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	
65	
66	
67	
68	
69	
70	
71	
72	
73	
74	
75	
76	
77	
78	
79	
80	
81	
82	
83	
84	
85	
86	
87	
88	
89	
90	
91	
92	
93	
94	
95	
96	
97	
98	
99	
100	

Submitted by: SACRAMENTO DISTRICT
1325 J. STREET
IN-HOUSE DESIGN
SACRAMENTO, CA 95814-2922

Reviewed by: L. FRESCAS
Spec No.: 1139
Design file no.: 131-25-1130
Date: 1/1/00

Drawn by: M. ZAKSKORN
Spec No.: 1139
Design file no.: 131-25-1130
Date: 1/1/00

Checked by: J. THOMAS
Spec No.: 1139
Design file no.: 131-25-1130
Date: 1/1/00

Plot scale: 1" = 100'

File name: B10E601.DWG

Plot date: 6/24/01

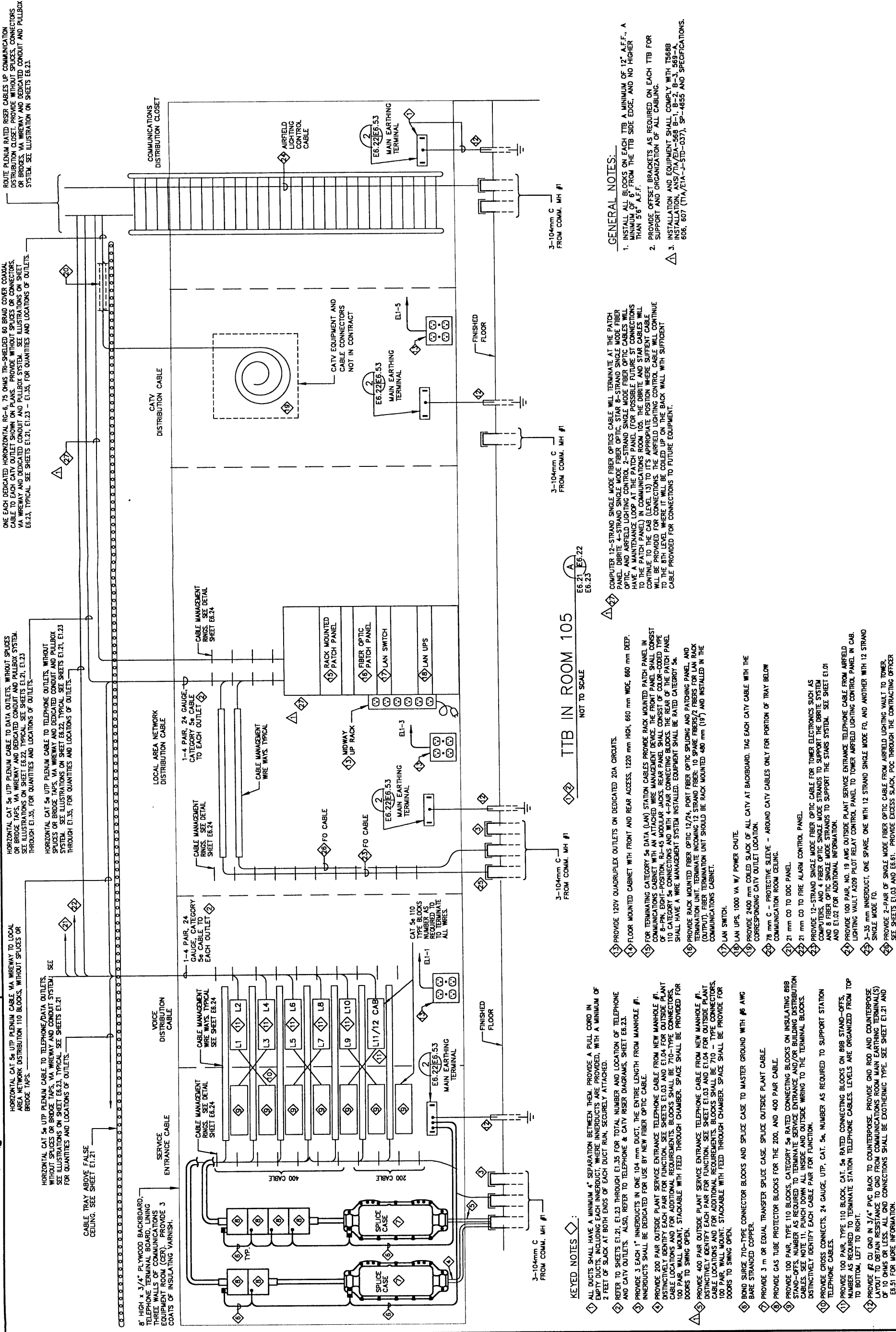
BEALE AFB
AIR TRAFFIC
CONTROL TOWER
POWER ONE-LINE DIAGRAM
CALIFORNIA

Sheet
reference
number:
E6.01
Sheet

4

3

2



US Army Corps of Engineers
Sacramento District

Rev.	Date	Description
1	6/24/01	100% DESIGN
2	6/24/01	100% DESIGN
3	6/24/01	100% DESIGN
4	6/24/01	100% DESIGN
5	6/24/01	100% DESIGN
6	6/24/01	100% DESIGN
7	6/24/01	100% DESIGN
8	6/24/01	100% DESIGN
9	6/24/01	100% DESIGN
10	6/24/01	100% DESIGN
11	6/24/01	100% DESIGN
12	6/24/01	100% DESIGN
13	6/24/01	100% DESIGN
14	6/24/01	100% DESIGN
15	6/24/01	100% DESIGN
16	6/24/01	100% DESIGN
17	6/24/01	100% DESIGN
18	6/24/01	100% DESIGN
19	6/24/01	100% DESIGN
20	6/24/01	100% DESIGN
21	6/24/01	100% DESIGN
22	6/24/01	100% DESIGN
23	6/24/01	100% DESIGN
24	6/24/01	100% DESIGN

Submitted by J. Thompson E. Nielsen	Reviewed by J. Thompson E. Nielsen
File name B106522.DWG	Spec No. 1139
Plot date 6/24/01	Design file no. 131-25-1310
Plot scale 1:1	Date 6/24/01

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA
IN-HOUSE DESIGN
1325 J STREET
SACRAMENTO, CA 95814-2922

BEALE AFB
AIR TRAFFIC
CONTROL TOWER
COMMUNICATIONS SYSTEM
DIAGRAMS AND DETAILS
CALIFORNIA

Sheet
reference
number:
E6.22
Sheet

PANEL: PANEL M		DC DEVICE TYPE: Breaker		ENCLOSURE: NEMA 1		MAINS(A): MLD		BUS RATINGS(A):	
LOCATION: RM 108		DEVICE FAMILY: Bolt On		MOUNTING: Surface		WIRING: 3 PHASE 4 WIRE		BUS WITHSTAND(A): 22000	
FED FROM: T3 SEC				VOLTAGE: 480				FAULT CURRENT(A): 9666	
CKT	DESCRIPTION	NOTES	DEMAND CODE	VA	DC AMPS P	PHASE	VA	DEMAND CODE	DESCRIPTION
1	BUS-0065		NONE	1509	0 3	A	50000	NONE	BUS-CAP
2	"			1509		B	50000		"
3	"			1509		C	50000		"
4	BUS-CP-1		NONE	1146	20 3	A	0	NONE	BUS-CP-2
5	"			1146		B	0		"
6	"			1146		C	0		"
7	"			1146		A	0		"
8	BUS-ELEV		NONE	14570	100 3	C	0	SPACE	SPACE
9	"			14570		A	0		"
10	"			14570		B	0		"
11	"			14570		C	0		"
12	BUS-JP		SPACE	14570	0 3	A	0	NONE	BUS-JP
13	"			14570		B	0		"
14	"			14570		C	0		"
15	BUS-ACC-1		NONE	23750	150 3	A	0	NONE	BUS-ACC-2
16	"			23750		B	0		"
17	"			23750		C	0		"
18	T3 PRI		NONE	23473	175 3	A	0	NONE	T3 PRI
19	"			23473		B	0		"
20	"			23473		C	0		"
21	PNL M11		NONE	42270	250 3	A	0	GEN	TVSS
22	"			42270		B	0		"
23	"			42270		C	0		"
24	SCHEDULE TOTALS			■ PHASE TOTALS	■ AMPS	■ VA	■ BUS TOTALS		
25	TOTAL CONNECTED	KVA		■ PHASE A	196618.0	0	■ PHASE A	407.4	KVA
26	TOTAL DEMAND	400.1		■ PHASE B	196618.0	0	■ PHASE B	407.4	CONNECTED
27	TOTAL DESIGN	461.7		■ PHASE C	196618.0	0	■ PHASE C	332.5	DESIGN
28					555.3			390.6	

PANEL: PANEL LY		DC DEVICE TYPE: Breaker		ENCLOSURE: NEMA 1		MAINS(A): 50		BUS RATINGS(A):	
LOCATION: RM 108		DEVICE FAMILY: Bolt On		MOUNTING: Surface		WIRING: 3 PHASE 5 WIRE		BUS WITHSTAND(A): 10000	
FED FROM: T3 SEC				VOLTAGE: 208				FAULT CURRENT(A): 7043	
CKT	DESCRIPTION	NOTES	DEMAND CODE	VA	DC AMPS P	PHASE	VA	DEMAND CODE	DESCRIPTION
1	FP & EL BLDG LTS	RM 106, 108	REC LIGHTING	1250	20 1	A	1000	OFF EQ	AST CONSOLE
2	"			250	20 1	B	0	SPARE	SPARE
3	SPARE			0	20 1	C	0	SPARE	SPARE
4	SPARE			0	20 1	A	0	HEAT	ACC 1 & 2 HEAT TRACE
5	SPARE			0	20 1	B	0	SPARE	SPARE
6	SPARE			0	20 1	C	0	SPARE	SPARE
7	EUH-11 BLDG	RM 106	HEATING	1040	20 2	A	0	SPARE	SPARE
8	"			1040		B	0	SPARE	SPARE
9	"			1040		C	0	SPARE	SPARE
10	EF-12, 13	RM 106, 108	MOT	375	15 1	A	0	SPARE	SPARE
11	"			0	0 1	B	0	SPARE	SPARE
12	SPARE			0	0 1	C	0	SPARE	SPARE
13	YARD	RM 107	REC	1000	20 1	A	0	SPARE	SPARE
14	"			0	20 1	B	0	SPARE	SPARE
15	IRRIGATION CTR	IRRIGATION CTR	GEN	1000	15 1	A	0	SPARE	SPARE
16	"			0	0 1	B	0	SPARE	SPARE
17	SPACE			0	0 1	C	0	SPARE	SPARE
18	SPACE			0	0 1	A	0	SPARE	SPARE
19	SPACE			0	0 1	B	0	SPARE	SPARE
20	SPACE			0	0 1	C	0	SPARE	SPARE
21	SPACE			0	0 1	A	0	SPARE	SPARE
22	SPACE			0	0 1	B	0	SPARE	SPARE
23	SPACE			0	0 1	C	0	SPARE	SPARE
24	SPACE			0	0 1	A	0	SPARE	SPARE
25	SPACE			0	0 1	B	0	SPARE	SPARE
26	SPACE			0	0 1	C	0	SPARE	SPARE
27	SPACE			0	0 1	A	0	SPARE	SPARE
28	SPACE			0	0 1	B	0	SPARE	SPARE
29	SPACE			0	0 1	C	0	SPARE	SPARE
30	SPACE			0	0 1	A	0	SPARE	SPARE
31	SCHEDULE TOTALS			■ PHASE TOTALS	■ AMPS	■ VA	■ BUS TOTALS		
32	TOTAL CONNECTED	KVA		■ PHASE A	4875.0	40.6	■ PHASE A	8.2	KVA
33	TOTAL DEMAND	8.2		■ PHASE B	1290.0	10.7	■ PHASE B	8.2	CONNECTED
34	TOTAL DESIGN	9.1		■ PHASE C	2040.0	17.0	■ PHASE C	9.1	DESIGN

PANEL: PANEL M11		DC DEVICE TYPE: Breaker		ENCLOSURE: NEMA 1		MAINS(A): 225		BUS RATINGS(A):	
LOCATION: RM 1105		DEVICE FAMILY: Bolt On		MOUNTING: Surface		WIRING: 3 PHASE 5 WIRE		BUS WITHSTAND(A): 22000	
FED FROM: PNL M				VOLTAGE: 480				FAULT CURRENT(A): 6934	
CKT	DESCRIPTION	NOTES	DEMAND CODE	VA	DC AMPS P	PHASE	VA	DEMAND CODE	DESCRIPTION
1	SPARE		SPACE	0	30 3	A	7062	NONE	T4 PRI
2	"			0		B	7062		"
3	"			0		C	7062		"
4	BUS-AHU-1A		NONE	3906	20 3	A	1693	NONE	BUS-AHU-2
5	"			3906		B	1693		"
6	"			3906		C	1693		"
7	"			3906		A	1693		"
8	BUS-AHU-1B		NONE	0	30 3	A	10417	NONE	BUS-AHU-2 HS
9	"			0		B	10417		"
10	"			0		C	10417		"
11	"			0		A	10417		"
12	BUS-EDH-1		NONE	3906	40 3	A	15625	NONE	BUS-EDH-2
13	"			3906		B	15625		"
14	"			3906		C	15625		"
15	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
16	"			0		B	0		"
17	"			0		C	0		"
18	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
19	"			0		B	0		"
20	"			0		C	0		"
21	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
22	"			0		B	0		"
23	"			0		C	0		"
24	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
25	"			0		B	0		"
26	"			0		C	0		"
27	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
28	"			0		B	0		"
29	"			0		C	0		"
30	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
31	"			0		B	0		"
32	"			0		C	0		"
33	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
34	"			0		B	0		"
35	"			0		C	0		"
36	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
37	"			0		B	0		"
38	"			0		C	0		"
39	SPACE		SPACE	0	0 3	A	0	SPACE	SPACE
40	"			0		B	0		"
41	"			0		C	0		"
42	SCHEDULE TOTALS			■ PHASE TOTALS	■ AMPS	■ VA	■ BUS TOTALS		
43	TOTAL CONNECTED	KVA		■ PHASE A	124.1	0	■ PHASE A	103.2	KVA
44	TOTAL DEMAND	103.2		■ PHASE B	124.1	0	■ PHASE B	103.2	CONNECTED
45	TOTAL DESIGN	126.8		■ PHASE C	152.5	0	■ PHASE C	126.8	DESIGN

PANEL: PANEL LCP		DC DEVICE TYPE: Breaker		ENCLOSURE: NEMA 1		MAINS(A): 30		BUS RATINGS(A):	
LOCATION: RM 704		DEVICE FAMILY: Bolt On		MOUNTING: Surface		WIRING: 3 PHASE 5 WIRE		BUS WITHSTAND(A): 10000	
FED FROM: T4 SEC				VOLTAGE: 480				FAULT CURRENT(A): 1998	
CKT	DESCRIPTION	NOTES	DEMAND CODE	VA	DC AMPS P	PHASE	VA	DEMAND CODE	DESCRIPTION
1	TWR EXT LIGHTS	BLDG/CORR	LTS	208	20 1	A	1650	LTS	PARKING LOT
2	YARD EXT LIGHTS	RM 107	LTS	832	20 1	B	100	LTS	PLANTER LIGHTS
3	YARD INTERIOR	RM 107 INT.	LTS	832	20 1	C	0	SPARE	SPARE
4	SPACE	SPACE	SPACE	0	20 1	A	0	SPARE	SPACE
5	SPACE	SPACE	SPACE	0	20 1	B	0	SPARE	SPACE
6	SPACE	SPACE	SPACE	0	20 1	C	0	SPARE	SPACE
7	SPACE	SPACE	SPACE	0	0 1	A	0	SPACE	SPACE
8	SPACE	SPACE	SPACE	0	0 1	B	0	SPACE	SPACE
9	SPACE	SPACE	SPACE	0	0 1	C	0	SPACE	SPACE
10	SPACE	SPACE	SPACE	0	0 1	A	0	SPACE	SPACE
11	SPACE	SPACE	SPACE	0	0 1	B	0	SPACE	SPACE
12	SPACE	SPACE	SPACE	0	0 1	C	0	SPACE	SPACE
13	SCHEDULE TOTALS			■ PHASE TOTALS	■ AMPS	■ VA	■ BUS TOTALS		
14	TOTAL CONNECTED	KVA		■ PHASE A	3.6	6.7	■ PHASE A	3.6	KVA
15	TOTAL DEMAND	3.6		■ PHASE B	4.4	3.4	■ PHASE B	3.6	CONNECTED
16	TOTAL DESIGN	4.5		■ PHASE C	5.4	3.0	■ PHASE C	4.5	DESIGN



Control	Panel, CKT, NBR, CHANGES	Description	#/3/01	Approved
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓				
✓		</		